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ABSTRACT

The 1988-89 annual report presents fourth year activities and findings of 17 longitudinal studies (begun in 1986) on the effects and costs of early intervention with handicapped children. Major activities of this year focused on management of individual studies, recruitment of sites, and development of procedural refinements. For each of the project reports, information is presented on: the comparison populations, local contact person, coordinator, location, report date, study rationale, study overview, methods, intervention programs, data collection, results/discussion, and conclusions. An additional report presents the status of economic analyses of the longitudinal intervention programs. Reports are included for the following programs: New Orleans, Louisiana Periventricular-Intraventricular Hemorrhage (IVH) Very Low Birth Weight Project; Louisiana State University Medical Center Human Development Center (visually impaired); South Metropolitan Association/Lake McHenry (Illinois) Project; Arkansas Intensity Study; New Orleans (Louisiana) Association for Retarded Citizens; Jordan (Utah) School District; Salt Lake City (Utah) IVH Project; Charleston, South Carolina IVH Project; Columbus (Ohio) Medically Fragile Project; Wabash and Ohio Valley (Illinois) Special Education; Belleville (Illinois) Project; Des Moines (Iowa) Public Schools; Utah Parent Involvement Study (1986); Association for Children with Down Syndrome; Arkansas School for the Deaf; Project PITCH (Utah); and Utah Parent Involvement Study (1985). A bibliography of approximately 450 items is included. (DB)

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1988-89 ANNUAL REPORT

of the

Longitudinal Studies of the Effects and Costs of Early Intervention With Handicapped Children

Submitted to the

U.S. Department of Education

by the

Early Intervention Research Institute

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(801) 750-2003

Utah State University

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PREFACE

The following document contains the 1988-89 annual report of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.** This study is being conducted by the Early Intervention Research Institute at Utah State University as a part of a contract with the United States Department of Education, with additional funding being provided by the National Institute of Child Health and Human Development and the Bureau of Maternal and Child Health of the Public Health Service (Contract #300-85-0173). The study was initiated in the Fall of 1985. As called for in the study specifications provided by the federal government, the first subjects were enrolled in the longitudinal phase of the study in October of 1986. The study is designed to be continued at least through the Fall of 1990, with the expectation that another contract will be competitively awarded at that time to continue data collection efforts for an additional five years.

We emphasize that data, results, and tentative conclusions contained in this report are preliminary. We continue to enroll subjects in some of the studies, additional data are being collected in all studies, and additional analyses are being done on an ongoing basis. Furthermore, even though care has been taken to discover key punching, transcription, and computational errors, it is certain that not all such errors have been identified and corrected in this annual report. As work continues, more up-to-date information on any study reported in this document will be available from the Early Intervention Research Institute. Interested parties may contact EIRI directly to obtain such information.

Staff members contributing to writing sections of this report include: Glenna Boyce, Diane Behl, Glendon Casto, William Eiserman, Colette Escobar, Linda Goetze, Lee Huntington, Nancy Immel, Mark Innocenti, Chuck Lowitzer, Stacey McLinden, Lance Mortensen, Marcia Summers, Matthew Taylor, Martin Toohill, and Karl White. Preparation of this manuscript was done by Mary Ellen Heiner.

OVERVIEW

In the Fall of 1985, the U. S. Department of Education undertook a significant new initiative to investigate the longitudinal effects and costs of providing alternative types of early intervention services to handicapped children. Through a competitively awarded contract to the Early Intervention Research Institute at Utah State University, planning was undertaken for a series of longitudinal studies of the costs and effects of providing alternative types of early intervention services.

Background

The impetus for this type of a large scale research project stems from at least three sources. First, over the past 25 years, hundreds of research studies have been conducted to investigate the efficacy of early intervention programs with handicapped, disadvantaged, and at-risk children. Unfortunately, much of this research has suffered from serious methodological flaws, narrow definition of outcomes, and/or inadequately implemented interventions (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Most of the research which has been well done, has been done with disadvantaged children, and there are questions about the degree to which findings from research with such children will be applicable to children with handicaps (White & Casto, 1985). Consequently, there is very little credible research data which can be used to draw conclusions about what types of early intervention programs are best for which children.

Second, during the last 20 years there has been a dramatic increase in the availability of early intervention programs for handicapped children. This expansion is expected to continue and even increase with the recent passage of Public Law 99-457 which provides significant initiatives for states to mandate early intervention programs for children with handicaps by the Fall of 1991. Although much progress has been made, it is evident that the lack of high-quality research with handicapped children has been a substantial impediment to improving the quality of early intervention services to handicapped children. Furthermore, the rapid and continuing expansion has increased the need for better information about which early intervention programs are best for which children.

Third, during the last decade, resources for providing human service programs have become increasingly limited. This has led policy makers and program administrators to be more concerned about the costs as well as the effects of all human service programs. With regard to early intervention, there have been increasingly frequent questions about which types of programs are most cost-effective. Unfortunately, very little previous early intervention research has included a cost analysis component.

It was in the context of these three factors: 1) limited high-quality early intervention research children with handicaps, 2) pressures to expand early intervention programs for children with handicaps, and 3) the almost total absence of efficacy research which includes a cost-analysis component, that the U. S. Department of Education issued a Request for Proposals (RFP) in the Spring of 1985. This RFP called for a contractor who would conduct a series of experimental studies investigating the effects and costs of alternative types of early intervention with handicapped children. The RFP stipulated that each of those studies must be a randomized experiment in which two alternative types of intervention were compared, must consider the effects of the intervention for both children and families, must analyze the costs in conjunction with the effects of the alternative types of intervention, and must be carried out in field-based settings which were representative of state-of-the-art early intervention programs.

The RFP required that one group of studies would investigate the effects of varying the intensity of the intervention program, another series would investigate variations in the age at which the comprehensive intervention program began, and a final group of studies would investigate the effects of program variation. These studies were to be done with various subgroups of children with handicaps (e.g., visually impaired, hearing impaired, severely handicapped, etc.) instead of with disadvantaged or at-risk children. The contract provided funding for a 5-year period so that the effects of intervention could be assessed longitudinally, but the money was limited to actually conducting the research and could not be used to fund the intervention programs.

As a separate part of the contract, the recipient was also required to develop a system which could be used to describe the participating children, the nature of the intervention program, the costs, and the effects of a series of early intervention programs for children with handicaps. This system was to be designed in such a way that it could be used on a regional, state, or national basis. The intent of this data collection system was that it could be used by program administrators (e.g., a state coordinator of preschool programs) to systematically and objectively describe the type of programs being offered, identify gaps in the existing system, and draw conclusions about which programs were best for a particular purpose. This component of the contract was completed at the end of the 1987-88 year and is consequently not discussed in this report.

Specifications for the contract required a series of feasibility studies during the first year (1985-86), after which the Government would decide whether it would proceed with all or part of the proposed research workscope. Based on the work done during that first year (1985-86), the Government decided to proceed with all of the work outlined in the original RFP. As a result of the government's decision, the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children*** were initiated in October of 1986 and will extend through September 30, 1990. Depending on the results of the project to that point in time, federal officials have announced a plan to competitively award another 5-year contract which will continue to collect data so that the long-term effects of early intervention for children with handicaps can be assessed.

The purpose of this report is to summarize the current status of the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children***, describe the accomplishments during the fourth year of the project (1988-89), and describe the plans for the 1989-90 year. To set a context for the main body of the report, we will briefly summarize the activities and accomplishments during the first, second, and third years of the project (1985-86, 1986-87, and 1987-88, respectively), and outline the workscope that has been undertaken during the fourth year (1988-89) of the project.

Summary of Accomplishments During 1985-86

The primary task during the first year of the project was to identify the sites that would participate in the longitudinal studies. This task was made more difficult by the constraints imposed by the original RFP. For example, since the contract funds could not be used to actually provide services, service programs had to be identified who were willing and able to contribute financial resources (often substantial amounts) to conducting the expanded services necessary for the comparative experiments. In addition, collaborators had to be willing to abide by the conditions of the contract (random assignment of children to groups, extensive data collection for participating children and families, and provision of data necessary to calculate program costs and to verify treatment implementation). Finally, the type of research called for in the RFP eliminated many potential collaborators because of the necessity of having fairly large groups of handicapped children who were available for participation in the experimental groups.

The foregoing requirements necessitated a nationwide search for projects who were interested in collaborating in the longitudinal research. Over 50 programs were contacted and almost 25 were visited during the recruitment phase of the project. Using carefully developed criteria, EIRI staff narrowed the potential participants to a final set of 16 studies which were initiated in the Fall of 1986.

Another major activity during the first year was the development, pilot testing, revision, and finalization of the various procedures and protocols necessary to implement these studies. For example, from among the hundreds of measures available for measuring child and family progress, EIRI staff had to select those measures which appeared to be most appropriate for these particular studies of early intervention. Procedures also had to be developed for randomly assigning children to groups, conducting the cost-analyses, and collecting data on treatment verification. In some cases, the sites identified as collaborators needed assistance in enhancing various aspects of their program so that the research could be conducted. For example, staff worked with some programs in developing better child-find procedures, record keeping systems, inservice training protocols, and child assessment and evaluation techniques.

Based on the work referred to above, a series of four feasibility studies were conducted during the 1985-86 year. Three of these studies were carried out in conjunction with a special funding initiative in the state of Illinois, and one was conducted in Salt Lake City, Utah. Each of these studies used the various procedures, data collection protocols, and management techniques that were being developed for the larger set of studies.

The purpose of these feasibility studies was to collect data that would assist the government in deciding whether it was feasible to conduct the series of longitudinal studies called for in the original RFP. The feasibility studies led to revisions of several protocols and to rethinking of some of the management strategies being considered for the larger set of studies. For example, the feasibility studies made it clear that the degree of training and monitoring that would be necessary for diagnosticians to appropriately use the Battelle Developmental Inventory would have to be substantially greater than had first been anticipated. The feasibility studies also suggested that additional work would have to be devoted to identifying instruments appropriate for assessing motor development in very young children and for assessing mother-child interaction. In many other areas, the feasibility studies yielded valuable insights which had a substantial impact on how the longitudinal studies were eventually structured.

A fourth major activity of the first year was to raise additional money that could be used to enhance various aspects of the research. From the beginning it had been clear that the money available from the U.S. Department of Education would only allow a "bare bones" research project to be conducted. Particularly concerning was the limited amount of funds available for collecting outcome data for children and families, and the lack of funds available for "buying out" a portion of time of some of the staff at each of the collaborating research sites that would allow them to devote the necessary time and effort to the liaison activities necessary in this type of research.

During the first year (1985-86) EIRI staff devoted substantial amounts of time and effort to raising additional funds. Hundreds of private foundations were contacted, the Utah State Legislature was approached, and work was initiated with several other federal funding agencies. As a result of these efforts, an ongoing $50,000 per year appropriation was received from the Utah State Legislature, a number of small donations were obtained from private companies and foundations, and a substantial amount of money was obtained from the National Institute of Child Health and Human Development, and the Bureau of Maternal and Child Health. The money obtained dramatically increased the amount of data that could be collected as a part of the research and will enhance the interpretability of those data because of the expanded treatment verification and site liaison activities.

Accomplishments During 1986-87

Although the contract did not call for the studies to begin until October 1, 1986, when the second year of the contract actually began, it was necessary to begin several of the studies prior to that time because of the service year calendar of several of the collaborators. In other words, for some of the collaborators, the service year began in August or September and in order to have children randomly assigned to groups, it was necessary to begin the experiment at the beginning of their service year as opposed to part way into it.

From the beginning it was clear that the continuation of any one of the studies for the full time period of the contract would depend on a number of factors which were not under the control of EIRI or the service provider. For example, a number of the programs depended on state appropriated money for both their basic program and the expanded program necessary to do the research comparisons. If the state cut funding for the program, the research project would be jeopardized. In other cases, the recruitment of subjects did not proceed as projected and the success of the project was called into question (e.g., in several studies with low birthweight babies with intraventricular hemorrhaging, we found the incidence to have dropped substantially from previous years). Because the successful implementation of any given study was in part dependent on factors which we could not control, we continued to recruit additional sites and maintained several alternative research sites.

The following activities occurred during the second year of the project (1986-87).

Study implementation. Eighteen different longitudinal studies were implemented. These included several changes from those studies reported in the baseline report. For example, based on much lower than estimated recruitment, we decided to only conduct one study for children with intraventricular hemorrhage instead of the two originally planned in conjunction with Louisiana State University. The second LSU/IVH study was replaced with a similar population of children in the Salt Lake City area. For similar reasons, two studies at the Alabama Institute for the Deaf and Blind Visually Impaired were dropped based on much lower enrollment of subjects than anticipated. Those two studies were replaced by studies at Phoenix Children's Hospital which were designed to investigate intensity and age-at-start issues with children who had suffered traumatic brain injury.

Refine procedures. The basic procedures for conducting the studies were developed during the initial year of the project. However, during 1986-87 it was evident that several areas needed further work, particularly the procedures for recruiting, training, and monitoring diagnosticians; treatment verification; and cost-data collection. Work in these areas proceeded simultaneously with the implementation of the studies.

Recruitment of additional sites. As discussed above, there was a need to replace several of the research sites identified in the baseline report. In addition, there was always a possibility that one of the existing sites would experience difficulties and have to be dropped. Hence, substantial efforts were devoted to identifying and recruiting potential collaborators. The two sites at Phoenix Children's Hospital, the Salt Lake City IVH site, and the alternate site in Reno were added this year as a function of those ongoing recruitment efforts.

Finalize arrangements for additional resources. During the 1985-86 year, preliminary approval was obtained from the National Institute of Child Health and Human Development and the Bureau of Maternal and Child Health for supplementing the Department of Education contract. However, substantial additional work was necessary to finalize those arrangements. Negotiations were completed in April of 1987 with NICHD, and in July of 1987 with MCH.

Training of graduate students. A part of the workscope specified in the RFP was the provision of training to graduate students. During 1986-87, 19 graduate students and one post doctoral fellow were employed by the institute. These individuals participated in all aspects of the work commensurate with their skills and experiences.

Accomplishments for 1987-88

During 1987-88, institute staff continued the conduct of the studies initiated the previous year. An overview of the major activities and accomplishments during 1987-88 is given next.

Management of individual studies. Individual site coordinators worked with each of the study sites to oversee the implementation of alternative interventions to ensure that alternative interventions were appropriately implemented. Periodic site visits and weekly telephone contacts were made to each of the sites. A formal onsite evaluation using a structured format was conducted. The site coordinators arranged for the collection of treatment verification data and arranged with the liaison person at each site for the collection of pre- and posttest data. Data collection required the recruitment, training, and monitoring of diagnosticians in each of the sites. The site coordinators also worked with economists at EIRI and with site liaisons to collect the necessary data for cost analyses. The management of the research comparisons at each of the sites required continual attention to make sure that necessary data were being collected and that alternative implementations were being implemented as planned. As outcome data were collected, site coordinators were also responsible for cleaning, double checking, and entering the data into the computer files.

Recruitment of sites. Due to difficulties in recruiting the number of subjects they had originally expected, additional sites were dropped near the beginning of the 1987-88 year which necessitated the recruitment of additional sites. As a result of these recruitment efforts, negotiations were conducted with sites in site in Columbus, Ohio; Salt Lake City, Utah; and Chicago, Illinois. Substantial additional work was done during the year to identify an additional hearing impaired site with contacts being made in Houston, Florida, South Carolina, California, and Michigan. Although people in each of these sites expressed a great deal of interest in participating in the longitudinal research, the unavailability of sufficient funds for the service component of the research prevented any of them from becoming involved.

Procedural refinements. A longitudinal study of this nature requires ongoing procedural refinements. During the 1987-88 year, particular attention was devoted to measuring the degree to which parents are involved in early intervention programs. A number of alternatives were tried including telephone interviews, interviewer ratings, parent reports using postcards, and time diaries. None of these were particularly successful. Procedures for the estimation of costs have also been refined during the year. It was discovered that site liaisons required substantially more assistance than originally expected. Thus, procedures have been altered to account for the provision of such assistance. Effort was also devoted to refining the scoring systems for parent-child interaction. A number of established scoring systems were identified to be used to score the same videotapes in an effort to identify which scoring system produces the most accurate and valid estimator of parent-child interaction.

Analyses. Because of the extensive data being collected at each study on child and family functioning, demographic characteristics, and treatment verification variables, a number of different kinds of analyses are possible. During the 1987-88 year, samples sizes in many of the sites became large enough so that these analyses were initiated. During the 1987-88 year, the attention of research staff began to shift from the recruitment of sites and implementation of research to conducting the analyses.

Training of graduate assistants. A part of the workscope specified in the RFP is the provision of training to graduate students. During the 1987-88 year, 20 graduate students and one postdoctoral fellow were employed by the institute. These individuals participated in ways commensurate with their skills and experience in all aspects of the work described in the remainder of this report.

Dissemination. An important part of the institute's workscope is to disseminate information to professionals, parents, policymakers, and administrators. During the first several years of the project, dissemination was limited because the actual research had not yet been initiated. During the 1987-88 year, 36 journal articles, chapters in books, or manuscripts were produced; and 50 presentations were made at professional meetings.

Workscope for 1988-89

1988-89 was the fourth year of the **Longitudinal Studies'** contract, and the third year since most of the studies were initiated. The primary emphasis during this year was on continuing the implementation of the individual studies. More specific details are given below.

Management of individual studies. Individual site coordinators continued to work with each of the study sites to oversee the implementation of alternative interventions and to ensure that the experimental conditions were appropriately implemented. Periodic site visits and weekly telephone contacts were made to each of the sites. In most cases, another formal onsite evaluation, using a structured format, was conducted. Several of these onsite evaluations included independent evaluators who were not associated with Utah State University.

Site coordinators also arranged for the collection of treatment verification data and arranged with the liaison person at each site for the collection of pre- and posttest data. We experienced a significant amount of turn over in diagnosticians from the previous year, which necessitated further recruitment, training, and ongoing monitoring of diagnosticians at each of the sites. The management of the research comparisons at each of the sites required ongoing attention to make sure that necessary data were being collected and that alternative interventions were being implemented as planned. As outcome data have been collected, site coordinators were responsible for cleaning, double-checking, and entering the data into the computer for subsequent analyses.

Obtaining money for the provision of alternative intervention services emerged as a major responsibility of site coordinators during this year. A number of the sites have been receiving federal funding for providing the early intervention program which is a part of the research (e.g., LSU IVH and South Carolina IVH), and that money came to an end during this year. In other sites, state money had been provided and was shifted to other programs, reduced, or discontinued. The individual circumstances vary from site to site, but substantial amount of effort has been devoted to keeping the interventions funded in each of the sites.

Another issue which emerged this year has been the efforts necessary to minimize attrition. Children who have completed interventions and moved to other parts of the country have been located wherever possible and tested at appropriate times. In other cases, children have moved within the same geographic area, and have had to be relocated before testing could be done. A number of parents have simply lost interest in the project and efforts have been made to persuade them to continue to participate. The importance of having liaison people located at each of the sites has been emphasized in this process. In many cases, the money obtained from the Bureau of Maternal and Child Health allowed us to buy out a portion of a person's time who was located at the site. In those cases where we were able to buy out the time of an enthusiastic and committed person, problems with attrition and ongoing funding with the project have been fewer.

Recruitment of sites. At the beginning of the 1988-89 year, the Phoenix site received final notification that their application for a federal HCEEP project would not be approved, and their efforts to secure state money for the intervention program were also unsuccessful. Thus, even though we had been able to continue to enroll an adequate number of subjects for this important study, there was no longer sufficient money to operate the intervention portion of the program. Similarly, the state of Illinois reversed their decision to provide funding to the Chicago Hearing Impaired site. Both of the sites, consequently, had to be dropped. Prior to that time period, we had initiated discussions with a school district in Salt Lake City, and were able to finalize the arrangements necessary to add that site (Jordan Intensity Study). Final arrangements were also made to begin providing intervention to children in the Columbus Children's Hospital Site. Thus, there were two new sites that came into operation during this year. The biggest problem in operating the Longitudinal Studies has remained the securing of funds for providing alternative services.

Procedural refinements. Although most of the procedural details were established during the first several years of the project, there continue to be refinements and additions. For example, several of the sites implemented ecobehavioral observation techniques to obtain additional information about the types of activities in which interventionists and children were engaged and how those activities related to child progress. The analysis of parent-child interaction data has continued to require substantial effort. Our approach to the scoring of parent-child interaction has been to secure assistance from some of the people in the field who have developed the most widely-used systems (Dale Farran, Gerald Mahoney, and Kofi Marfo). At the end of last year we sent tapes to each of these people to have them code the tapes according to their systems. Preliminary analyses from those codings are included in this year's report, but much work still remains before we can decide which system is the best. Efforts have also been devoted to refining the measures of child health for all children and the measure of motor functioning for children in the IVH studies. Finally, we have begun preparations to shift from using the Battelle Developmental Inventory (BDI) to the Woodcock-Johnson Battery for those children who are now too old for the BDI to be used appropriately. A significant addition to this year has been the collection of data from teachers of children who are now enrolled in public school programs. A number of techniques have been used. The few sites where this was done during 1988-89 has provided valuable lessons that will become even more important as more children from other sites "graduate" into public school programs.

RESULTS OF THE LONGITUDINAL STUDIES

As the present time, 17 separate studies are being conducted as a part of the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children***. The activities and accomplishments during the 1988-89 year, the current status, and the future plans for each study are described in the remainder of the section. To facilitate comparisons between studies, a similar format has been followed wherever possible. It is emphasized that results for each study are preliminary. As new subjects are enrolled, additional data are collected and more analyses are done, the tentative conclusions of this report may change. The purpose of this document is to describe what has been done so far as a means of generating discussion and suggestions which will improve the interpretability of the Longitudinal Studies.

NEW ORLEANS, LOUISIANA IVH/VERY-LOW-BIRTHWEIGHT PROJECT

Project #1

COMPARISON: Grades III and IV Periventricular-Intraventricular Hemorrhage (IVH) or Very-Low-Birthweight Infants -- Treatment vs. No Treatment

LOCAL CONTACT PERSON: Patsy Poche, M.A.

EIRI COORDINATOR: Lee Huntington, Ph.D.

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 10-9-89

Rationale for Study

One of the major determinants of infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).

Forty percent of low birthweight infants (or approximately 90,000 infants) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile, Burstein, Burstein, & Koffler, 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is limited and controversial (Hynd, Harloge, & Noonan, 1984). Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Stage I and II LBW infants exhibited moderate handicapping conditions by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these handicaps. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe handicapping conditions, such as cerebral palsy, by the third year of life. Finally, Sostek, Smith, Katz, & Grant (1987) demonstrated that the severity of IVH did not predict the infant's developmental progress at 2-years of age, however 40% of the infants in that study showed significant delays at 2-years.

Although there is a fair amount of research on interventions for premature low-birth-weight babies (see Bennett, 1987; Casto, et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey, Bryant, Sparling, & Wasik, 1984; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH. Two recent studies which have had promising results (Als et al., 1986; Resnick et al., 1987) have focused on infants with more severe medical problems, but have still focused on in-hospital programs.

Those studies which have examined post-hospitalization home-based interventions have used a variety of intervention programs and had conflicting results. For example, Rice (1977) examined a home-based program of massage and stroking. At the four-month assessment, the experimental group showed greater weight gain, more mature neuronal reflexes, and higher Bayley Mental Development scores. Bromwich and Parmelee (1979) implemented a 14 month home visit program (between the ages of 10 and 24 months) designed to educate the parents with the direct goal of enhancing interactions and the indirect goal of affecting the infants' social-emotional and cognitive and language development. The groups did not differ on any of the cognitive measures at 2 years, but the experimental group scored better on the HOME scale.

Field et al., (1980) employed a half-hour, biweekly home visitor to teach the mothers about developmental milestones and childrearing, and to demonstrate exercises to facilitate the infants' development. The experimental group had significantly higher Bayley MDI scores at 8 months, and their mothers rated them significantly less difficult. While these studies demonstrate potential for early intervention, the methodological differences between them and the differences in outcomes which they found, make it impossible to draw compelling conclusions. For example, Rice (1977) and Field et al. (1980) began intervention at discharge, while Bromwich and Parmelee (1979) began intervention at 10 months of age. All three studies excluded infants with major complications. While Rice (1977) and Field et al. (1980) found group differences in cognitive measures at 4 and 8 months respectively, Bromwich and Parmelee did not find any differences in cognitive measures at 2 years after a 14 month intervention. Thus, considerably more research is needed to address such issues as the age at which intervention should start, intensity of intervention, and long term effects of intervention.

Overview of Study

A major issue in the study of early intervention in general is the effect of the intensity of treatment which the infants receive. The issue of intensity needs to be examined with particular care in infants who are "at-risk" for developmental problems because of severe medical complications. Because the nature of "risk" is probabilistic, it is a given that some if not many of the infants will improve and show little or no deficits without any intervention. If 60% (according to recent estimates) of the infants who suffer Grade III or IV IVH show only subtle problems later, then the effects of the intervention must be large enough to be detected despite the improvement found following the natural course of the complication. Thus, examination of intensity requires that the treatments be sufficiently different to maximize the possibility of detecting the effects of the intervention.

The previous level of service to medically fragile infants in the geographic area of this study consisted of only medical follow-up. The follow-up program examined each infant at 3 month intervals and made referrals to a variety of specialty clinics, but little organized effort was made to ensure that parents followed-through on the referrals. This level of service ensured that most medically fragile infants in the area did not receive intervention services until they were developed major handicapping conditions or were three years of age and qualified for preschool special education programs. Because the typical level of service was so sparse, an intervention program was developed which could be compared in a treatment-no treatment design. Briefly, this intervention program consisted of 1) in hospital recruitment and transition into the intervention program. 2) weekly home visits by members of a transdisciplinary team, and 3) an optional parent group meeting once a month. Children assigned to the non-intervention group continued to receive the standard level of treatment in the community.

Methods

This study was conducted in cooperation with the Community Action for Parental Success (CAPS) program at Louisiana State University Medical Center. CAPS provided services through a collection of community-based agencies for minority, low income, and handicapped infants. Services were offered in three modules: (1) In the hospital, while the infant was in the neonatal intensive care unit; (2) at home, once the child was released from the hospital; and (3) at a center for parent/child intervention, when the infant was older and medically stable. The design of this program differs from previous services in that intervention began at birth and was provided in a transdisciplinary framework, infants were seen weekly, and referral to other services was immediate, with help accessing those services provided by the intervention team.

Full-time direct service staff for CAPS consisted of a Program Coordinator, Occupational Therapist, and Speech Pathologist/Infant Specialist. Part-time direct service staff included a nurse, nurse practitioner, paraprofessional home-visitor, and a social worker.

Subjects

As of September 1, 1989, there are 32 children who are currently between 10 and 32 months of age enrolled in the study. Of these, 18 have been posttested[1]. Subjects included in this study were either diagnosed by ultrasound as having experienced periventricular-intraventricular hemorrhage or were born with a birthweight lower than 1000 g. Subject recruitment closed in October 1988. The current sample is composed of 90% Black and 10% White infants from both urban and rural areas of the greater New Orleans metropolitan area.

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[1] *Two infants (one in the early intervention and one in the no intervention group) were not pretested because they were hospitalized into their ninth month of life. These two are not included in the current analyses.*

Recruitment. Infants qualified for participation in the research if they had been a patient in the NICU at Charity Hospital or Tulane Medical Center and if they had experienced perinatal intraventricular hemorrhage (IVH) of Grades III or IV severity or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment. Subjects who met the inclusion criteria were identified while in the NICU. Parents of eligible infants were contacted in the while their infant was still in the NICU and then telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions depending upon where random assignment placed them.

Assignment to groups. All assignment to groups was performed by the site coordinator at the Early Intervention Research Institute (EIRI). For the purposes of this study, it was necessary to ensure that the distribution of grades of IVH and birthweights be comparable between the treatment and control groups. The treatment and control conditions were thus stratified by severity of IVH (Grades III or IV) and birthweight (under 1000 g or over 1000 g) yielding a 2 (Grade; III or IV) x 2 (Birthweight; under 1000 g or over 1000 g) design. Imposing this stratification scheme on the treatment and control group yielded a 2 x 2 x 2 design. Those infants who did not suffer IVH, but were below 1000 grams, were stratified on the number of days that they were on a ventilator to ensure the comparability of the groups. Before any infants were assigned, a random number generator indicated the order of assignment to treatment or control for each sequence of four children fitting a stratification cell. The four cells thus differed on the order in which children with those characteristics were assigned to the treatment or control group. After four infants with particular stratification characteristics were assigned, the random number generator was used to designate another assignment order for the next four infants in that cell. Parents were informed of their infant's assignment after they gave approval to participate in the study.

Demographic characteristics. Demographic information on the subjects and their families was gathered from a questionnaire and from medical discharge summaries. All of the children were from families who resided in the metropolitan area of New Orleans, Louisiana. The demographic characteristics of the sample, divided by groups is represented in Table 1.1. A larger proportion of single parent than two parent families were represented in the study. The enrolled families were predominantly low income and included some single adolescent mothers. The proportion of single mothers in the intervention and control groups differed significantly for the 18 infants who have had their first posttest. Examination of the data for the overall group indicates, however, that for the entire sample, this proportion is balanced. There was also a marginal difference in the number of years of education for the mothers, but again, the overall group is balanced on this variable.

Currently, 3 subjects who were enrolled have been lost to the study. One died after enrollment, but before testing, and the other two died after pretesting, but before posttesting. These subjects' pretest data were not included in the current analyses.

Intervention Programs

The comparison for this study is between a group of infants who receive the medical follow-up program offered by the hospital and a group of infants who receive an organized early intervention program conducted by the Human Development Center.

No Intervention

The comparison group for this study consisted of infants who received the typical level of services in the community. These services consisted of the medical

Table 1.1

Comparability of Groups on Demographic Characteristics
for LSU Treatment, No Treatment

Variable	Active Subjects Enrolled By July 1, 1989								Subjects Used in First Posttest Analyses							
	No Intervention			Early Intervention			p Value	ES $	No Intervention			Early Intervention			p Value	ES $
	X̄	(SD)	n	X̄	(SD)	n			X̄	(SD)	n	X̄	(SD)	n		
• Age of child in months as of 7/1/89	21.2	(7.4)	14	22.3	(7.4)	16	.67	.13	26.3	(6.2)	6	24.7	(7.2)	12	.65	-.24
• Age of mother in years	27.1	(8.2)	12	25.3	(5.8)	13	.53	|.26|	25.0	(2.8)	6	25.1	(6.2)	9	.99	|.02|
• Age of father in years	28.9	(5.2)	10	28.0	(4.4)	12	.67	|.19|	27.9	(4.6)	5	26.8	(4.1)	8	.66	|.25|
• Percent male *	43		14	62		16	.30	|.18|	50		6	50		12	1.00	|0.0|
• Percent with Birthweight <1000	76		13	62		16	.66	.11	83		6	58		12	.30	.15
• Years of education for mother	11.2	(1.5)	14	10.5	(2.1)	15	.33	-.39	12.2	(.8)	6	10.8	(2.1)	11	.08	-.77
• Years of education for father	11.8	(1.3)	11	12.4	(2.0)	10	.44	.36	12.6	(1.3)	5	12.8	(1.3)	6	.78	.15
• Percent with both * parents living at home	42		12	33		15	.67	.07	67		6	18		11	.05	.34
• Percent of children who are caucasian *	7		14	13		15	.60	.05	17		6	9		11	.67	.08
• Hours per week mother employed	6.8	(15.2)	11	0	(0)	13	.17	|.44|	7	(15.7)	5	0	(0)	9	.38	|.44|
• Hours per week father employed	25	(22.9)	5	30	(18.6)	8	.67	|.24|	41.7	(2.9)	3	40	(0)	5	.47	|.59|
• Percent of mothers employed as technical managerial or above *	0		11	0		15	1.00	0.0	0		5	0		11	1.0	0.0
• Percent of fathers employed as technical managerial or above *	0		4	12.5		8	.67	.03	0		2	0		4	1.0	0.0
• Total household income	5,500	(4,194.2)	12	10,000	(7,786.2)	13	.09	.75	5,400	(4,588)	5	8,550	(3,996)	10	.19	.33
• Percent receiving public assistance *	85		13	63		16	.20	.17	83		6	67		12	.49	.09
• Percent with mother as primary caregiver *	64		14	69		16	.80	.04	100		6	75		12	.27	-.14
• Percent of children in day care more than 5 hours per week *	9		11	0		16	.85	|.09|	17		6	0		12	.33	|.16|
• Number of siblings	1.8	(2.9)	12	1.1	(.9)	16	.44	|.5|	.33	(.8)	6	.75	(.6)	12	.24	|.6|
• Percent with English as primary language *	100		10	100		13	1.00	0.0	100		4	100		10	1.00	0.0

*Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not posessing the trait were scored as "0."

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follow-up program described in the introduction. Because these families did not have routine monthly contact with the intervention staff they were contacted approximately every three months by the coordinator of the intervention program. The families were queried about their child's health, and reminded that they would be asked to return for later evaluation.

Expanded Intervention Program

The intervention package for this research project consisted of select educational procedures which have been used routinely in a number of settings. The intervention package consisted of three components: hospital-based, home-based, and center-based.

Hospital-based component. The hospital-based phase took place at Charity Hospital and Tulane Medical Center Hospital. The purpose of this phase was to provide families of the experimental group with early contact with members of the intervention staff, to reinforce teaching conducted by hospital staff, and to provide information on accessing appropriate community services such as Handicapped Children's Services. The Brazelton Neonatal Behavioral Assessment Scale (NBAS) was used to develop an individualized description of the infant to be used for parent training. For example, if an infant showed low autonomic stability on the NBAS, the interventionist would plan ways to work with the mother on soothing and not overstimulating the infant. The NBAS was administered by the Project Nurse who was certified by staff from Boston Children's Hospital in the administration of the NBAS.

Home-based component. The second phase of the project began after NICU discharge, and consisted of home-based early intervention conducted cooperatively with an existing social service agency home-based parent training program for low-income mothers. The purpose of this phase of the program was to provide the infant's family with follow-up training on the proper care and handling of the infant. The infant was assessed, and an Individual Family Service Plan (IFSP) was developed in cooperation with the parents. Treatment objectives were determined in the areas of the infant's and family's greatest needs, but typically included objectives from the motor, self-help, receptive language, and social-emotional areas. The treatment program was delivered by the parents.

Individual family and child activities were designed to be integrated into the normal daily activities of the families. The four curriculum domains were compatible with routine daily activities such as feeding, dressing, and playing. Traditional developmental domains such as communication, cognitive, and gross and fine motor, and therapy techniques such as positioning and handling, were integrated into these routine activities throughout each of the three phases.

The primary interventionists, in addition to the parents, were a transdisciplinary team, with one member of the team assigned as case manager for each infant and family enrolled in the intervention. The other members of the team provided regular input on family and child progress, and consulted in their areas of specialty when needed. Each family was scheduled for a weekly one hour home visits. Simple, practical programs were left with the principal caregivers each week, and performance was monitored weekly through an observation checklist.

Center-based component. The third phase of the intervention consisted of an optional center-based early intervention program conducted with the Urban League Parent/Child Center program. This program consisted of twice monthly parent group meetings conducted by a social worker and devoted to topics such as nutrition and childrearing.

Each of the intervention phases was driven by an Individualized Family Service Plan which was developed by the transdisciplinary team. One of the full-time staff was designated case manager. The case manager could, therefore, have been an occupational therapist, speech pathologist, infant specialist, or social worker. Representatives from each of the collaborating agencies were involved in the development of initial and follow-up IFSP goals, objectives, and activities. The case manager was responsible for assuring that direct service as well as referral objectives were met.

Treatment verification. A number of procedures were developed to verify that treatment was being implemented as intended. For example, the intervention team recorded all home visits and telephone contacts with the family using a cumulative Monthly Contact Summary Sheet. Cancellations and hospitalizations were also noted. The data for the past year indicate that the infants in the intervention have received an average of 68% of the scheduled weekly home visits, accounting for 2.7 hours per month working at home with the interventionist. While 68% at first sounds low, the circumstances of the population who are receiving services must be considered. The families are mostly inner-city, low-income families, often single parents, with an average education of less than high school level. Maintaining these families' interest and participation in the intervention program is difficult at best. Other providers of service to similar populations have communicated difficulty maintaining even 50% participation (Tiffany Field, personal communication)

As a measure of the time that parents spent implementing the intervention, the interventionist elicited from parents an estimate of the amount of time per week that was spent with the child in activities that were recommended by the therapist. Parents reported an average of 2.25 hours per week, ranging from .33 to 3.75 hours. In addition, the interventionist rated their impression of the accuracy of the parent's report on a 3-point scale, with 1 being not accurate to 3 being very accurate. Analysis of these data indicate that the interventionists' ratings of the parents averaged 2.1, indicating that the interventionists considered the parents fairly accurate in their reports of the time spent working with their children.

Formal site reviews have been conducted periodically since the intervention program began. Site review visits was conducted in October, 1987, March 1988, and

August, 1989. The purpose of these reviews was to collect information about the nature and quality of early intervention services being delivered. The site reviews were conducted according to the treatment verification process described in the Treatment Verification Handbook for Research Sites (EIRI, 1987), according to the procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Appendix A of the handbook. This research site rated very highly on all criteria of the site review. Especially impressive were their procedures for Individual Family Service Plan Development, and their coordination of IFSPs and ongoing lesson planning. Dr. Tiffany Field accompanied the most recent visit as an outside reviewer. Dr. Field was selected because of her vast experience with interventions for medically fragile infants. Dr. Field spoke highly of the skills of the home interventionist whom she accompanied on a home visit.

Cost of the early intervention program. The cost per child for the 18 children receiving services in 1988-89 was calculated based on the ingredients approach (this approach has been discussed in detail in previous EIRI annual reports) and is presented on Table 1.2. Costs were calculated for the intervention only; medical costs associated with IVH infants have been calculated for the Salt Lake City and South Carolina IVH studies and are available on request.

Resources used for the intervention include direct service and administrative personnel, university administration overhead, parent time, occupancy, equipment, travel, materials and supplies, telephone, and miscellaneous expenses.

Personnel costs are based on the salary and benefits for 2 case managers, a speech therapist, a social worker, and administrative staff (the director and a secretary) according to the percentage of FTE worked on the intervention project. In addition, neurological consultation services were purchased on a contractual basis throughout the year. Consultation costs were based on the proportion of time applied to direct service. University administration overhead was calculated using the university's indirect rate of 12.6% for general, departmental, and sponsored projects

Table 1.2

Cost of One Year of Intervention per Child for LSU-IVH Site (1988-89)

Resources	Cost per Child (n=18)
Agency Resources	
Direct services	$ 3,362
Administration	
program	608
university	555
Occupancy	147
Equipment	72
Travel	88
Materials/supplies	83
Telephone	37
Miscellaneous	11
SUBTOTAL	$ 4,963
Contributed Resources	
Parent Time	1,242
TOTAL	***$ 6,205***

administration. Because this program relies heavily on parent time during home visits with professionals and also to learn and apply intervention techniques with their children, the value of parent time was included. The opportunity cost of parent time is based on the average hourly wage rate for full time work plus benefits for women in the U.S., $9/hour. Parents in the study spent an average of 30 hours per year in home visits with a program professional, and 108 hours working at home with their child. Occupancy charges were calculated based on the approximate cost of office leasing in the area according to local realtors, $9 per square foot. This includes maintenance, utilities (except telephone), and insurance. The project used

294 square feet this year (pro-rated according to FTE). Equipment costs were calculated by taking inventory of all office equipment and furniture, assigning a market replacement value to each item, annualizing the cost accounting for interest and depreciation, and prorating cost according to FTE worked on the project. Travel costs are based on case managers' mileage records for home visits and one trip per family to the center at $15 per trip. Finally, the cost of telephone and materials and supplies are based on annual project expenditures on these items. Further economic analyses, comparing the cost with benefits of the project, are pending.

Data Collection

Data were collected for this project to determine the effect of early intervention upon the child and the family. The assessment instruments were chosen to provide consistency of data collection between sites. However, some assessment instruments were chosen for this project to assess child and family variables unique to early intervention with infants suffering Grade III and IV IVH.

Recruitment, training, and monitoring of diagnosticians. Four local diagnosticians were trained to administer the pre- and posttest measures. The diagnosticians have master's degrees. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations was conducted by another trained diagnostician. Interrater reliability data reveal an average coefficient of .88.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants were tested with the BDI, the Movement Assessment of Infants (MAI) and a neurological assessment. The parents complete the Parenting Stress Index (PSI) a measure of the stress perceived by the parents, the Family Support Scale (FSS), a measure of the number of sources of support available, the Family Resource Scale (FRS), a measure of the adequacy of resources available, the Family Inventory of Life Events and Changes (FILE), which tallys the stress producing events of the past year, and the Family Adaptability and Cohesion Evaluation Scales (FACES III), which measures the cohesiveness and adaptability of the family system. The BDI was administered by a trained diagnostician who was unaware of the infant's group assignment. Test and questionnaire protocols were sent to the site coordinator for scoring and placement in a data file. A duplicate set of the data was sent to EIRI. Parents were paid $45 for their time in completing the evaluation session. The pretest assessment battery provides information about the child's early developmental status and neurological functioning. In addition, family measures provide information on family reaction to the newborn, parent stress, and family support systems.

Posttesting. Posttesting occurs at 12 months corrected age and annually thereafter. The posttest battery was administered by a diagnostician who was "blind" to the subject's group assignment. The child was given the BDI, the MAI, and a follow-up neurological examination and the parent again completed the PSI, FILE, FACES III, FSS, FRS. Parents also completed a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents were paid $35 for completion of the evaluation. Additional measures taken at 12-months corrected age were videotapes of mother-infant interaction and one of motor development completed by a trained child development specialist or licensed physical therapist. Parents were paid $10 as an incentive.

The videotape of motor functioning followed a specific script. The motor script had the child perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape recorded the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent was instructed to encourage the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds, and taping continued for two minutes after the parent returned to the room.

Results and Discussion

The purpose of this study is to examine the effects of a family and child directed early intervention program. Eighteen of the subjects have reached the age of first posttesting, and two have received their second posttest. Thus the data analyses for this report examined the initial comparability of the groups at pretest and the measures of child and family functioning at the first posttest.

Initial Comparability of Groups

Table 1.3 represents the comparison of the pretest measures for the intervention and control groups on the child functioning and family measures. The left half of the table represents the data for all subjects currently enrolled in the study. The right half of the table represents the data for those subjects who have received their first posttest as of September 1, 1989. There were no statistically significant differences between the groups on the pretest measures. Taken together with the lack of between groups differences on the demographic characteristics, these results suggest that the random assignment of infants to groups resulted in groups that were comparable in terms of scores on both the infant and family measures at the onset of the intervention process.

Table 1.3

LSU-IVH Treatment - No Treatment Study

Comparability of Groups on Pretest Measures

	Active Subjects Enrolled By July 1, 1989							Subjects Included in First Posttest Analyses								
	No Intervention			Early Intervention				No Intervention			Early Intervention					
Variable	X̄	(SD)	n	X̄	(SD)	n	P Value	X̄	(SD)	n	X̄	(SD)	n	ANOVA F	P Value	ES[$]
•Age in months at Pretest	3.8	(2.2)	14	3.5	(1.2)	15	.62	4.0	(1.7)	6	3.3	(0.8)	12	1.38	.26	
•Battelle Developmental Inventory (BDI)[*] DQs for:																
Personal Social	108	(46)	14	95	(54)	16	.46	85	(51)	6	86	(45)	12	.003	.95	.02
Adaptive Behavior	88	(60)	14	92	(49)	16	.85	90	(78)	6	98	(45)	12	0.10	.76	.10
Motor	84	(36)	14	88	(30)	16	.74	76	(40)	6	86	(28)	12	0.38	.54	.13
Communication	77	(49)	14	68	(50)	16	.64	72	(48)	6	72	(54)	12	0.05	.82	.00
Cognitive	60	(39)	14	61	(39)	16	.96	57	(40)	6	53	(35)	12	.000	.99	-.10
TOTAL	84	(34)	14	86	(38)	16	.84	74	(43)	6	84	(40)	12	0.26	.62	.23
•Parenting Stress Index (PSI)																
Child Related	110	(17)	14	113	(14)	16	.55	117	(22)	6	114	(9)	12	.19	.67	.14
Other Related	116	(21)	14	122	(22)	16	.43	113	(28)	6	126	(18)	12	1.42	.25	-.46
TOTAL	225	(32)	14	235	(33)	16	.42	230	(44)	6	240	(22)	12	.40	.54	-.23
•Family Adaptation and Cohesion Evaluation Scales (FACES)[+]																
Adaption	5.4	(3.5)	13	6.1	(2.9)	16	.53	6.9	(4.4)	6	6.5	(3.0)	12	.04	.83	.09
Cohesion	4.3	(2.6)	13	5.5	(2.9)	16	.28	4.8	(1.5)	6	5.2	(3.0)	12	.09	.77	-.27
Discrepancy	10.1	(10.4)	13	11.5	(7.5)	16	.67	11.5	12.8	6	12.4	(5.7)	12	.05	.83	-.07
TOTAL	7.1	(3.8)	13	8.8	(2.4)	16	.16	8.8	(3.4)	6	9.1	(1.7)	12	.05	.83	-.08
•Family Resource Scale (FRS)[&]	119.1	(13.8)	14	108.3	(13.6)	16	.04	121.3	(17.7)	6	109.4	(13)	12	2.64	.12	-.67
•Family Support Scale (PSS)[&]	24.0	(13.4)	14	25.9	(9.9)	16	.66	25.7	(16.9)	6	23.3	(9.1)	12	.16	.69	-.14
•Family Index of Events (FILE)	7.2	(5.5)	13	9.9	(7.6)	16	.28	4.3	(3.9)	6	9.3	(7.9)	12	2.02	.17	-1.28

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

[$] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divide by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

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Effects of Early Intervention Versus Medical Follow-up Without Intervention on Measures of Child and Family Functioning

The effects of the early intervention program on child functioning were assessed using the Battelle Developmental Inventory and the Movement Assessment of Infants.[2] These data were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b) to statistically adjust for any pretreatment differences between the groups. For either purpose, the degree to which ANCOVA is useful depends on the correlation between the covariates selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. Thus, the 1st posttest data were analyzed in a three-stage procedure.

First, the pretest BDI, demographics, and parent measures were examined for potential differences which might affect the posttest scores and which could thus be used as covariates in the analyses of the posttest results. As reported above, the only measure on which groups differed significantly was the pretest FRS score.

The second stage of the analyses examined the relations between the posttest scores on the child and family measures and the pretest measures via multiple regression analyses, again looking for potential covariates. Pretest variables that were strongly associated with the posttest measures were used as covariates in the third stage of the analyses; one-way between-groups analyses of covariance (ANCOVAs). The pretest variables that were used as covariates in a particular analysis are indicated in the column labeled "Covariates" in Table 1.4, which represents the results of the analyses of the first posttest child and family measures.

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[2] *The MAI, Carey, and the motor and interaction videotapes are currently being analyzed. Results of these analyses will be reported in next year's final report.*

Analysis of the BDI scores indicated that the intervention and non intervention groups did not differ significantly on any of the subscales or on the total BDI score. There was a marginal difference between the groups on the adaptive behavior scale ($\underline{F}(1,16)=3.41$, $\underline{p}=.08$), with the early intervention group scoring higher than the nonintervention group. While none of the differences were statistically significant, all except one favored the early intervention group. In addition, the effect sizes for the personal social, adaptive behavior, and cognitive subscales as well as for the total BDI score, were fairly large, ranging from .27 to .75. These effect sizes suggest that with a larger sample size the between groups differences might be statistically significant.

Analysis of the PSI indicated that the groups did not differ significantly on either the child related stress scale or the other related stress scale. The effect size for child related stress (.38) indicates a large difference between the groups. With a larger sample size, this difference might be statistically significant. This result would indicate that those parents who had received intervention reported less stress related to their child than those who had not.

The results of the analysis of the FACES III again indicated no statistically significant between groups differences. Again, however, examination of the effect sizes indicates a substantial effect size (.33) on the cohesion subscale, indicating that those parents who received early intervention services reported a more cohesive family pattern.

Table 1.4

Posttest Measures of Child Functioning for Alternative Intervention Groups for LSU-IVH Treatment No Treatment Comparison

		No Intervention Group				Early Intervention Group						
Variable	Covariates[Δ]	$\overline{X}$	(SD)	Adj $\overline{X}$	n	$\overline{X}$	(SD)	Adj $\overline{X}$	n	ANCOVA F	P Value	ES[$]
• Age in months at Posttest	---	17	(2.8)		6	16	(1.5)		12	.71	.41	
•Battelle Developmental Inventory (BDI)[*]	---											
DQs for:												
Personal Social	1	73	(40.0)	75	6	89	(42.0)	88	12	.61	.45	-.32
Adaptive Behavior	4	64	(32.0)	66	6	93	(37.0)	90	12	3.41	.085	.75
Motor	4	69	(39.0)	73	6	83	(32.0)	80	12	.64	.44	.18
Communication	4	74	(35.0)	77	6	80	(33.0)	76	12	.01	.94	-.03
Cognitive	4	70	(43.0)	72	6	90	(32.0)	86	12	1.23	.28	.32
TOTAL	2	76	(40.0)	78	6	91	(35.0)	89	12	.88	.36	.27
•Parenting Stress Index (PSI)												
Child Related	5	126	(21)	124	6	115	(13.0)	116	12	1.85	.19	.38
Other Related	5	125	(13)	124	6	124	(15.0)	125	12	.01	.92	-.08
TOTAL	5	251	(33)	249	6	240	(24.0)	242	12	.47	.50	.21
•Family Adaptation and Cohesion Evaluation Scales (FACES)												
Adaption	6	4.8	(4.0)	4.7	6	5.1	(2.6)	5.1	12	.09	.77	-.10
Cohesion	2, 3	6.3	(3.9)	6.3	6	5.0	(4.6)	5.0	12	.38	.54	.33
Discrepancy	Discrep	2.1	(16.7)		6	10.4	(15.0)		12	1.08	.32	-.50
TOTAL	3	8.5	(3.9)	8.6	6	8.2	(2.7)	8.1	12	.10	.76	.13
•Family Resource Scale (FRS)[&]	4, 7	111	(13)	109	6	110	(20.0)	112	12	.07	.80	.23
•Family Support Scale (FSS)[&]	8	35	(14)	34	6	31	(13.0)	32	11	.18	.68	-.14
•Family Index of Events (FILE)	9	6.2	(7.0)	7.8	6	14.4	(14.0)	12.8	12	.64	.44	-.71

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For each of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

[$] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divide by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

Δ Covariates 1 = Battelle Personal Social, 2 = Battelle Adaptive Behavior, 3 = Battelle Cognitive, 4 = Battelle Total, 5 = PSI Child Related Stress, 6 = FACES Total, 7 = FACES Cohesion, 8 = FSS Score, 9 = FILE Total Score. All covariates are pretest scores

Analyses of the FRS and FSS indicated that the groups did not differ significantly on the number of resources or amount of support that they reported. Analysis of the FILE indicated that the groups did not differ significantly, however, the large negative effect size indicates that the nonintervention group reported fewer stressful life events during the previous twelve months, a difference which might be significant given a larger sample size.

Conclusions

This project is in a position to provide useful data on the efficacy of an intensive intervention program for prevention or amelioration of developmental delays in infants at risk because of a history of complications of preterm birth. The program is the only one of its type in the geographic area in which it is being implemented, and by comparison with the standard of service for medically fragile infants in the area will provide a strong contrast in intensity of intervention.

Analyses of the demographic data and the pretest data indicates that the random assignment procedure has been successful in assuring the initial balance of the groups. There were no differences between the groups on the demographic measures or on child or family measures at pretest.

While the results of the parametric analyses indicate that there were not statistically significant differences between groups on the child or family outcome measures the large effect sizes on some of the measures indicate differences which might show significance given a large sample size. Examination of the pattern of effect sizes reveals some interesting results. Of 16 analyses, 8 showed effect sizes greater than .25. Especially interesting, is the fact that 6 of the 8 effect sizes greater than .25 indicated differences in favor of the early intervention group.

Closer examination of the effect sizes indicates that a consistent pattern for the BDI results. All of the effect sizes greater than .25 (4 of 6) on the BDI results favored the intervention group. Comparison of pre- and posttest results indicates that the posttest results were not the result of existing pretest group differences. The pretest effect sizes for the BDI scales ranged from -.10 to .10, indicating substantially no systematic differences between the groups. The posttest effect size differences are attributed to a drop in BDI Scores on the part of the nonintervention group. This result is consistent with other reports of declining test scores in similar low-SES populations. This result suggests that a similar decline may be reduced by the support provided by the early intervention program.

The effect sizes for the PSI indicate a similar result. The child related stress scale of the PSI showed an effect size of .38 favoring the early intervention group. The pretest effect size indicated that the groups did not differ on this scale. In fact, at pretest the early intervention group reported a higher level of other related stress, a difference which was not found at the posttest. Comparison of the group means for child related stress indicates that the average stress level reported by the early intervention group remained the same between pre- and posttest, while that reported by the nonintervention group increased by 9 points. The increase in the stress level of the nonintervention group could be the result of having to care for the needs of a medically fragile infant without the support of an intervention staff.

The results of the analyses of the FACES III scales also are consistent with positive effects of the early intervention program. The cohesion scale, which showed an effect in favor of the nonintervention group at pretest (ES = -.27) showed an effect in favor of the intervention group at posttest. Examination of the group means again indicates that the change in effect sizes is attributable to the change in the score of the nonintervention group. While the level of family cohesion reported by the intervention group remained the same between pre- and posttest, the nonintervention group reported less cohesion at posttest. This effect might also be attributable to the support provided by the early intervention program.

The effect size results for the discrepancy scale of the FACES III indicate that the early intervention group rates their ideal family pattern more different from the actual pattern than does the nonintervention group. The pretest effect size indicated that the groups did not differ on their perceptions of this discrepancy. As was the case with BDI scores and PSI scores, the change in the effect size is attributable to a decrease in the discrepancy reported by the nonintervention group and not to an increase in the discrepancy reported by the intervention group. This result is consistent with results reported by other intervention programs for medically fragile infants. For example, Zeskind and Iacino (1982) reported that mothers who received an intervention designed to support visitation of their infants in the nursery perceived their infants as less healthy, and had lower expectations for them than did mothers who spent less time with their infants. Thus, it is possible that the effect seen in the current study indicates that the parents who work more with their children see more closely the problems that their children have, and thus report more discrepancy between the ideal and actual family pattern.

While these results are interesting, they must be considered tentative. Eight subjects remain to be posttested at one year. The addition of these data could change the results described here. For example, addition of these subjects might result in statistically significant results in those measures that now show large effect sizes. These results will be discussed in next year's annual report.

LOUISIANA STATE UNIVERSITY MEDICAL CENTER
HUMAN DEVELOPMENT CENTER (LSU/VI)

Project #2

COMPARISON: Visually Impaired Children -- Weekly individualized parent-infant sessions versus parent group meetings.

LOCAL CONTACT PERSON: Patsy Poche, Louisiana State University Medical Center

EIRI COORDINATOR: Diane Behl

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 10-9-89

Rationale for Study

The importance of vision in early development is crucial, (see discussions by Barraga, 1986; Ferrell, 1986 Fraiberg, 1977; and Warren, 1977). By age three, infants with visual impairments often demonstrate socio-communicative and cognitive development patterns that are quantitatively and qualitatively different from their sighted peers (Ferrell, 1986; Warren, 1984). Ferrell (1986) stated that all of these secondary handicaps are preventable; they occur because there has not been sufficient, systematic intervention given to the child and his/her family. Although such a position is logical, there is little evidence in the literature which either confirms or refutes the value of systematic intervention in alleviating these secondary handicaps.

Visual impairment also causes a disruption in the interaction between the caregiver and child. Als (1983) observed that the infant with visual impairments signals and communicates differently. These signals are often distorted and difficult to interpret, making positive, constructive interaction even more difficult for parents who often are attempting to cope with the emotions of having an infant with a handicap. Rowland (1984) summarized the findings of researchers involved with visually impaired children by stating, "The importance of appropriate exchanges between mothers and infants cannot be overstressed." This highlights the importance of involving parents in the intervention process.

Though the importance of early intervention for children with visual impairments and their families has been noted frequently in literature, few controlled prospective studies have been completed on children with visual impairments, especially at the infant and toddler levels (Warren, 1984). Furthermore, even though researchers speculate that intensive intervention for both child and family is necessary, there is a dearth of evidence regarding the intensity with which this intervention should be provided. Additionally, little data are found to assist in answering the question of how to provide the best intervention (White et al., 1986).

This study of early intervention for visually impaired infants and toddlers compares the immediate and long-term effects of a comprehensive, home-based intervention in the form of one time per week parent-child sessions with a much lower intensity treatment of informal parent group meetings held approximately 12 times per year. To set the context for this study, existing research on the effects of early intervention with visually impaired children will first be summarized briefly. A description of this study will follow, providing a description of the subjects and the alternative interventions, as well as the research procedures. Results based on the first two years of the study then will be presented along with preliminary conclusions.

Review of Related Research

Since 1969, eight studies with quasi-experimental designs and appropriate outcome data have been conducted with visually impaired children in an attempt to provide some degree of objective information on the effectiveness of early intervention. The nature of these studies, including subjects, intervention, outcome measures, and results are summarized in Table 2.1. Unfortunately, critical components necessary for the studies to be considered well-controlled investigations were lacking. These components will be discussed with reference to the studies presented in Table 2.1. These elements will now be discussed.

Of primary importance is the lack of appropriate comparison groups reported in past studies; the visually impaired subjects were typically compared to either normally sighted peers or a blind comparison group from a previous study (see Table 2.1). The current study improved upon these research designs by utilizing random assignment of a sample of visually impaired children to one of two treatment conditions. In addition to lacking appropriate comparison groups, the conclusions of these previous studies are difficult to interpret because very little demographic information is presented about participating subjects, i.e., it is difficult to know whether subjects which come from families with high socio-economic status respond differently to intervention than subjects which come from families with low socio-economic status or whether subjects which are more severely visually impaired respond differently than those who have moderate visual impairments. Because of the extensive demographic data collected as a part of this study, such questions can be examined.

A second important point relative to previous research is that exemplary services designed for children with visual impairments have generally been described as needing to be comprehensive in nature, providing systematic instruction to the child as well as providing parents with instructional strategies and support. Unfortunately, most previous studies have not

Table 2.1

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Description	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Adelson & Fraiberg (1974)	10 infants, mod-severely VI, no other handicaps.	Bimonthly home visits for 1-2 years. Developmental guidance program linking sound and touch in play and parent-infant interactions.	Posttest only compared with sighted control and with large group of VI infants from earlier study.	Gross Motor Items from Gessell & Amatruda; Bayley Scales of Infant Development.	Intervention can accelerate development of mobility in children with visual impairments.	-- Small sample. -- Comparison VI group had almost 3 times as many premature infants or had later entry ages. -- Visits in control (VI) group every 3 months. -- No random assignment. -- Control group used different outcome measures.
Allegheny County Schools (1969)	Seven preschoolers, all legally blind with varying developmental levels.	6 weeks of center-based training emphasizing exploration and independence.	Pre-posttest	Orientation and mobility of Young and Blind Children (Lord, 1967). Body Image of Blind Children Screening Test (American Foundation). Video tapes over time.	Intervention improved several aspects of self-help, vision, and socialization.	-- Small sample. -- No control group. -- Possibly had inconsistent program. -- No treatment verification.
Bregani, Ceppellini, Cerebalini, Contini, Damascelli, Livingstone, Premoli, & Rocca (1981)	8 infants and toddlers with ROP.	Weekly 1-hour visits for 1 year focused on parent-child interaction.	Pre-posttest	Brunet-Lezine Scale of Psychomotor Development, Neurological and ocular exams.	Intervention had positive effects on mother-infant dyads presumed to be at-risk for psychotic disturbances.	-- Small sample. -- No control group.
Correa, Poulson, & Salzburg (1984)	3 preschool children, severely multiply handicapped.	One-time training in reach-grasp responding conducted in a center.	Multiple baseline design.	Recording of reach-grasp responses.	Intervention effective for training motor skills in blind, severely retarded preschoolers.	-- Small sample. -- No control group. -- More than one handicap -- Not typical intervention
Fraiberg (1977)	10 blind infants, no other handicaps.	Twice-monthly home visits for three years focusing on parent-child interactions.	Pre-posttest.	Videotaped performance.	Intervention improved VI children to levels closer to sighted children than blind children who received no intervention.	-- Small sample size. -- No control group.
O'Brien (1976)	33 subjects, Birth to 8 years with mild to severe VI.	Home or center-based, parent training for 8 months emphasizing overall development.	Pre-posttest.	Visual Effic. Scale; school health forms, Bolea Pictorial Self-Concept Scale, Boehm Test of Basic Concepts (1971), anecdotal records, instruments developed by researchers.	Program goals were met.	-- Not all instruments standardized. -- No control group. -- No uninformed testers. -- Interventions differed across subjects.
Olson (1983)	15 VI 2-6 year olds.	Home or school intervention for an average of 2.7 years.	Post-only comparison based on initial differences and sighted control group.	Performances rated by teachers of VI children; independent viewing and scoring of 10 categories of behavior.	Intervention created no significant difference between sighted and visually impaired children.	-- Differences in past education confound study. -- No VI control group. -- Interventions differed across subjects.
Rogow (1982)	10 subjects, 1-7 years of age, multihandicapped.	Home or school intervention for 10 months using graduated prompting strategies.	Pre-post.	Piagetian stages of language development to determine child's functional level of communication via parents, teachers, videotapes.	Intervention increased awareness of social interaction.	-- No non-treatment group. -- Small sample size. -- Very heterogenous group. -- Intervention differed across subjects.

Adapted from Olson, M. (1987). Early intervention for children with visual impairments. In M. J. Guralnick & F. C. Bennett (Eds.), The effectiveness of early intervention for at-risk and handicapped children (pp. 318-321). Orlando, FL: Academic Press.

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provided clear descriptions of their interventions. The lack of information about specific training techniques, curricula, and shaping procedures has made it difficult to understand the comprehensiveness of previous treatments as well as making it difficult for others to replicate the interventions. (Guralnick & Bennett, 1987). For the current project, the collection of treatment verification data, described more fully in a subsequent section, will provide specific information facilitating replication of any effective treatments.

The use of a home-based intervention as the high intensity treatment was chosen for several reasons. Home-based programs serving handicapped or at-risk young children are experiencing rapid growth, making it one of the most typical intervention models in the field (Halpern, 1984). Philosophically, there are numerous advantages to a home-based intervention and the involvement of the family. Some of the earliest advocates of home-based intervention, Shearer and Shearer (1976) argued that home-based intervention was good because:

> (1) Learning occurs in the parent and child's natural environment.... (2) There is direct and constant access to behavior as it occurs naturally.... (3) It is more likely that learned behavior will generalize and be maintained.... (4) There is more opportunity for full family participation in the teaching process.... (5) There is access to the full range of behaviors.... (6) Training of parents, who already are natural reinforcing agents, will provide them with the skills necessary to deal with the new behaviors when they occur.... and (7) Because the home teacher is working on a one-to-one basis with the parents and child, individualization of instructional goals for both is an operational reality. (pp. 336-337)

There are also advantages to home based intervention that are more practical in nature. For rural or low-income families, travel to a center location is often difficult. Additionally, some children have medical needs that make leaving the home difficult (Bailey & Simeonsson, 1988). In spite of these theoretical and practical justifications for home-based intervention, previous research has provided very little comparative evidence about the effectiveness of home-based intervention, particularly for visually impaired children. This controlled study comparing a well-designed treatment serving both parent and child with a control condition of lower intensity which provides indirect services only to the parents will add greatly to the knowledge needed to respond to the aforementioned questions.

As a third point, the majority of previous studies have failed to measure critical outcomes that may have been affected by the intervention. Using a family-focused approach, the high intensity intervention is sensitive to the effects of the child on the total family, the effects of the family on the child, and the effects of external supports on the child and family. Through the use of measures sensitive to these interactions, this study will provide important assessment data that have been missing from previous studies. (see Table 2.1)

Fourth, longitudinal data are needed to determine whether effective early intervention programs continue to have a noticeable effect on children as they get older (Warren, 1984). Though five of the eight previously cited studies with visually impaired children had interventions that were at least eight months in duration, none of them provided information regarding long-term effects of the treatment. Since this study will include outcome data for several years following the treatment, it will provide some needed information concerning long-term treatment results.

Finally, this study will provide an economic perspective on early intervention. One would expect the intensive program to be much more expensive. Therefore, it is important to find out whether the additional costs are justified in terms of the gains made by children or the effects on the family. Furthermore, it is important to find out whether a less expensive program such as the low intensity parent group meetings may result in some benefits (e.g., positive effects on family functioning) that may not be present in the more expensive program which focuses more directly on child progress. Unfortunately, very little attention has been given to cost analysis issues in previous early intervention research, particularly with visually impaired children.

Methods

This study is being conducted in collaboration with the Human Development Center (HDC, a University Affiliated Program) at Louisiana State University Medical Center in New Orleans. Funding for the HDC is provided in part by the Department of Education, Office of Special Education and state and local sources. Services for child in both groups are funded by the Louisiana Office of Education. The service program was designed and developed by a certified teacher of the visually impaired with extensive experience in service provision and research. Staff who provide services include home intervenors, a social worker, and consulting service providers who are therapists at the HDC. The program was developed specifically for the research project and provides services to visually impaired children and their families who would otherwise receive no services designed for visually impaired children.

The geographical area served includes the area within a 60 mile radius of New Orleans. Other services available for visually impaired 0-3 year old children are limited to programs designed to serve developmentally delayed children or those that provide private motor and/or speech/language therapy. There is no other program in the area that provides programming specifically to meet the needs of children who are visually impaired. Consequently, most visually impaired 0-3 year old children in this area have typically not received any services until they were 3 years old.

Assistance in the identification of potential research subjects as well as information regarding various aspects of the subject's vision (i.e., acuity, perception, and discrimination) is provided by the LSU Eye Center.

Subjects

A total of 36 children between the ages of 0 to 30 months have been identified and randomly assigned to groups as of July 1, 1989. The following section describes the recruitment and random assignment procedures for the study. Demographic characteristics of children and families in each group are also presented.

Recruitment. Subjects are being identified through referrals from the LSU Eye Center and from pediatricians and ophthalmologists in the New Orleans area. Children who are identified as potential subjects are screened by either the site coordinator or a teacher and therapist. Each child is classified according to visual acuity, presence of other handicapping conditions, and developmental level as follows.

Visual acuity: 1 = blind
2 = severely impaired with correction
3 = mildly or moderately impaired

Handicapping condition: 1 = no other handicapping condition
2 = presence of one or two mild handicaps
3 = more than two mild or severe handicaps

Developmental level: 1 = no more than a 33% delay in motor or socio-communication/cognitive areas
2 = more than 33% delay in either motor or socio-communication/cognitive areas
3 = more than 33% delay in both motor and socio-communication/cognitive areas

The presence of an additional handicapping condition is determined by the clinical judgement of qualified motor therapists and/or communication disorders specialists. Developmental level is obtained through the use of a screening instrument that consists of selected items from the Early Intervention

Developmental Profile (Brown et al., 1981). Children are eligible for inclusion in the study if the vision impairment is the major disability and the delays are due primarily to their vision impairment. Children who have more than two other handicapping conditions and who have more than a 33% delay in both motor and socio-communication/cognitive areas are not eligible for enrollment in the study.

As seen in Table 2.2, approximately two-thirds of the subjects have mild vision impairments (69% for each group), with one sixth falling in the moderately visually impaired group, and one sixth falling in the severely visually impaired group. In regard to degree of handicapping condition/developmental delays, the majority of subjects for both groups were rated as having no additional handicapping condition and/or significant developmental delay.

Table 2.2

LSU VI Intensity Study Subjects' Degree of Vision and Severity of Handicaps

	Low Intensity	High Intensity
Severe Vision Impairment ≤ 20/2400	19%	15%
Moderate Vision Impairment ≤ 20/900	13%	15%
Mild Vision Impairment ≤ 20/200	69%	69%
Handicapping Condition/Developmental Delay:		
No additional handicap/ developmental delay	69%	54%
1-2 mild-moderate handicap/ developmental delay	31%	46%

The most frequently-occurring causes of vision impairment for subjects are optic atrophy (10.3%), retinopathy of prematurity (31%), and albinism (17.2%); other etiologies are present in smaller numbers.

Most subjects involved in the study are not involved in other programs for children with disabilities. Several children who had received prior services were enrolled after having moved to the New Orleans area from another geographical region where services were provided. The random assignment process resulted in these subjects being balanced across both groups.

Identification of subjects has been progressing slowly for 1988-1989. Subjects were being enrolled at an average of 1-2 per month 1987-88. In spite of strong recruitment efforts however, only 4 subjects have been identified since July, 1988. Recruitment will continue through October, 1989, at which time it is estimated that enrollment will total 38-40 subjects.

Assignment to groups. After receiving a signed informed consent form from parents, children are randomly assigned to groups stratified by visual acuity, and a combined score for handicapping condition and developmental level. (Refer to the EIEI 1986-1987 report for a more detailed description of the assignment procedures). On February 13, 1987, the initial group of 15 children identified during screenings in the first two weeks of February were rank-ordered by age within the cells. The random assignment pattern was determined for each cell by a computer-simulated four-sided die. Children were assigned based on this pattern within cells. Children who were identified after that date were placed in the appropriate cell and assigned according to the assignment pattern.

Demographic characteristics. Demographic pretest data on 29 active subjects enrolled as of June 1, 1989, is reported in Table [illegible].3 (Data on the most recent subject was unavailable at the time of the report). The population from which children are being drawn is about 80% Caucasian and has a high degree of variability with respect to socioeconomic status. Although not statistically significant, there are some differences between groups (e.g., see percent receiving public assistance, with more subjects in the experimental group

Table 2.3

Comparability of Groups on Demographic Characteristics for LSU/VI Intensity Study
All Active Subjects Enrolled by July 1, 1989

Variable	Low Intensity			High Intensity			P Value	ES$^{\$}$
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
• Age of child in months at pretest	15.2	(9.8)	16	14.1	(12.5)	13	.79	-.11
• Age of mother in years at pretest	25.7	(4.4)	16	28.0	(6.7)	13	.26	|.52|
• Age of father in years at pretest	31.9	(8.8)	14	34.3	(10.7)	12	.53	|.27|
• Percent Male*	37%		16	54%		13	.40	|.34|
• Years of Education for Mother	13.1	(1.8)	16	12.8	(2.7)	13	.73	-.17
• Years of Education for Father	13.4	(3.0)	13	13.4	(3.4)	12	.98	0.0
• Percent with both parents living at home	69%		16	85%		13	.34	+.41
• Percent of children who are caucasian*	75%		16	85%		12	.54	+.18
• Hours per week mother employed	15.4	(18.5)	16	7.4	(15.1)	13	.22	|.43|
• Hours per week father employed	40.9	(16.6)	9	39.4	(22.7)	12	.87	|.09|
• Percent of mothers employed as technical managerial or above*	38%		16	15%		13	.20	-.46
• Percent of fathers employed as technical managerial or above*	33%		12	64%		11	.16	+.63
• Mean total household$^{\Delta}$ income	\$25,567	(17,159)	16	\$28,884	(27,910)	13	.61	+.19
(median)	\$25,000		16	\$13,000		13		
• Percent receiving public assistance*	25%		16	38%		13	.45	-.29
• Percent with mother as primary caregiver*	81%		16	85%		13	.82	+.10
• Percent of children in day care more than 5 hours per day*	44%		16	17%		13	.14	|.53|
• Number of siblings	.63	(.89)	16	.77	(.93)	13	.67	|.16|
• Percent with English as primary language*	100%		16	100%		13	1.00	0.0

*Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1" and those not possessing the characteristic were scored "0

$^{\Delta}$Means and standard deviations for this variable were estimated from categorical data.

$^{\$}$Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the $\overline{X}$ scores divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

receiving assistance, and differences between groups on hours per week the mother is employed). Some demographic data related to the father are missing due primarily to single parent families with estranged fathers. Differences in household income appear to be due to the small number of subjects, with a few high-income families skewing the mean. It is anticipated that these differences in demographic variables will disappear or at least diminish in significance as more subjects are enrolled.

To date, 26 of the 29 active subjects have completed Posttest #1. Demographics for these 26 subjects are comparable to those shown in Table 2.3. Table 2.4 depicts comparability of groups included in Posttest #2. The only variables nearing significance for Posttest #2 were the age of the mother, percentage of males, and percent of children in daycare more than 5 hours per day, with the high intensity group having slightly older mothers, a larger percentage of boys, and a smaller percentage of children in daycare more than 5 hours per day. However, since Year 2 posttest data have been collected on only half of the active subjects, it is anticipated that these differences will decrease as more subjects are tested.

Intervention Programs

The alternative interventions consist of weekly individualized home-based intervention versus parent group meetings that are held approximately 12 times per year. A detailed description of the treatments follows.

Weekly individualized treatment. The more intensive intervention for 0- through 36-month-old subjects consists of parent-infant sessions in which parents or primary caregivers and their children are given a structured program individualized to meet the needs of the family as well as the child.

All infants/toddlers in the individualized treatment group are scheduled for an average of 1 hour of intervention weekly. Generally, intervention

Table 2.4
LSU/VI Intensity Study Demographic Characteristics of Subjects included in Year 2 Posttest

Variable	Low Intensity $\overline{X}$	(SD)	GP1 n	High Intensity $\overline{X}$	(SD)	GP2 n	P Value	ES$
• Age of child in months at pretest	17.3	(11.3)	9	20.1	(13.7)	7	.66	+.25
• Age of mother in years at pretest	27.0	(4.1)	9	32.1	(5.7)	7	.06	|1.24|
• Age of father in years at pretest	35.0	(7.9)	8	40.0	(10.3)	7	.27	|.63|
• Percent Male*	22%		9	57%		7	.17	|.80|
• Years of Education for Mother	13.6	(1.7)	9	13.4	(3.0)	7	.92	-.12
• Years of Education for Father	14.3	(3.4)	7	14.4	(3.6)	7	.94	+.03
• Percent with both parents living at home*	78%		9	86%		7	.71	+.18
• Percent of children who are caucasian*	78%		9	86%		7	.71	+.18
• Hours per week mother employed	18.9	(18.3)	9	8.0	(15.3)	7	.23	|.60|
• Hours per week father employed	50.0	(7.1)	4	43.6	(25.6)	7	.64	|.90|
• Percent of mothers employed as technical managerial or above*	44%		9	26%		7	.55	-.28
• Percent of fathers employed as technical managerial or above*	50%		6	57%		7	.82	+.13
• Total household income△	$28,000	(17,762)	9	$40,857	(33,142)	7	.33	
• Percent receiving public assistance*	11%		9	29%		7	.41	-.52
• Percent with mother as primary caregiver*	78%		9	86%		7	.71	+.18
• Percent of children in day care more than 5 hours per week*	56%		9	17%		6	.15	|.74|
• Number of siblings	.67	(1.0)	9	1.29	(.95)	7	.23	|.62|
• Percent with English as primary language*	100%		9	100%		7	1.00	0

*Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1" and those not possessing the characteristic were scored "0."

$ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

services are provided in the child's home. The activities incorporate daily routines, such as feeding, diapering and changing, as well as familiar toys and household items. In three instances, it has been necessary for the parent to bring the child to the program center for intervention services. The travel expenses for these families are covered through program funds. One child attended a regular preschool, 5 days a week, and the program teacher provides services there. Meetings were held between program staff, preschool staff, and the parent to discuss and plan strategies and exchange information. All parties were pleased with this pattern of service delivery which is, in fact, the most natural setting for this child.

The model of intervention is based on the guidelines set forth by P.L. 99-457 in regard to serving the families of children ages birth through 3 years of age. A case manager coordinates services for the family. The case manager is typically the education specialist, depending on the needs of the family unit. Individualized Family Service Plans are developed to meet the needs of the child and family.

During the home visits, the primary caregiver is involved in the intervention with the child. With some families, the role of caregiver varies among parents, grandparents, babysitter, and preschool teacher. In any event, the person with primary caregiving responsibility for the child at the time is an active participant in the session.

In instances in which a parent is not the primary caregiver during program intervention sessions, every effort is made to share information with them in telephone contacts and other visits. The degree of caregiver involvement in any one session is individualized according to the needs and skills of the caregiver. The role of the intervenor may be assumed almost entirely by the caregiver, with the program teacher guiding and giving feedback. In other instances, the program teacher may demonstrate while the caregiver observes. In most sessions, there is a combination of these patterns. New activities are generally first introduced by the program teacher, who then instructs the caregiver in implementing the activity. Parents are involved in implementing stimulation activities, collecting data and charting behavior in the home between sessions.

In addition to focusing on specific needs of the individual infant/toddlers, the needs of the family in relation to the child are addressed. Treatment reflects the family's needs in regard to interacting with the child, developing their general knowledge of visual impairments, and improving their skills in encouraging their child's development. Needs for assistance or guidance in obtaining community services such as medical or day care services for their child are also addressed.

The Louisiana Curriculum for Infants with Handicaps, which was developed by the Staff of the Human Development Center, forms the basis for development of intervention activities for this program. The activities in the curriculum take into account the total child and the interactive nature of development across domains.

Activities (lessons) have been developed for the domains of gross motor, fine motor, cognition, self-help, social-emotional, and communication. Information with each lesson includes: area, goal, rationale, materials, cautions, teaching procedures, teaching notes, and evaluation criteria. A data collection sheet is available for use by parents and program staff.

A Curriculum Placement Instrument (CPI) for each domain was developed in conjunction with curriculum and serves as means for choosing activities appropriate for the status of child and family. Modifications are made in specific activities in the curriculum, in consultation with the professional staff, in order to adapt them to the child's needs and as appropriate for the child's vision.

In addition to the observation and modeling provided by the program teacher, parents are provided instructions on how to implement a specific lesson and the type of weekly data to be collected. Often parents request information on a particular topic related to visual impairment or child development. The home intervenor provides supplemental information from the Reach Out and Teach curriculum (Ferrell, 1986). This is a manual designed to provide parents with information about visual impairments and appropriate general stimulation activities.

As previously discussed, the parent was viewed as the child's primary intervenor in that the parent spends the most time with the child and has the greatest opportunity to integrate the intervention strategies into the daily routine. The program teacher is the primary contact person working closely with the parents or other caregivers to provide the intervention. The program teacher plans sessions and activities, guides interventions, collects data, maintains attendance records and individual child folders, and coordinates consultations and direct services from other professionals. Two certified teachers experienced in serving young children with special needs are currently serving as the intervenors for the high intensity group.

The speech therapist, occupational therapist, physical therapist and social worker at the Human Development Center are available to assist in meeting needs of the infants/toddlers and their families enrolled in this program. All children are seen, initially, by at least one of these specialists in the screening process. Depending upon the impairments of the child and needs of the family, the specialists are called upon for consultation with the program teacher and/or parents, or for provision of direct services. For example, the speech therapist may assist the teacher to design a feeding program; the OT and PT consult and provide direct services for several children with gross and fine motor problems. The role of the social worker has been expanded to provide more direct intervention with families. The social worker maintains close contacts with the families, interacting with them 1-2 times per month.

Low Intensity Parent Group Treatment. Families in the low intensity control group are offered services in the form of group meetings which are held approximately 12 times per year for roughly one hour each. The scheduling of the parent group meetings has changed slightly for this year. During 1987 and the majority of 1988, parent group meetings were conducted approximately twice monthly, for approximately 9 months out of the year. Due to staff and funding changes, meetings have been rescheduled to be held in two sessions, each session consisting of 6 weekly meetings. Although informal, there is always a specific topic for discussion, with readings assigned and time for questions and answers. Slides and tapes developed for use with Reach Out and Teach have also been used. After an introductory meeting, appropriate professionals attend the meetings to discuss cognitive development, social skills and temperament. Presentations have focused on the effects of visual impairment on these various areas of development with general suggestions for compensation. General stimulation activities are suggested, but no individualized treatment plans or activities are provided.

After each presentation by a professional, parents have time to ask specific questions and discuss issues of concern to them. Discussion has been generated by the Reach Out and Teach books. For example, the differences among the visual impairments of the children whose parents attend the group meetings may be a topic of discussion. These sessions also function as a support group, whereby parents with older children who are visually impaired may offer support and information to the parents of younger children.

Treatment Verification

A number of procedures have been implemented in order to verify that treatment is being implemented as intended. They include:

Collection of attendance data. Parent and child participation in the individual sessions, as well as parent involvement in group meetings, is recorded according to length of session and staff involved. Non-attendance at regularly scheduled sessions is also recorded according to the reason for non-attendance (e.g., child illness, vacation etc.). Attendance data are summarized in Table 2.5 for all subjects who have been enrolled in the study for 12 months or more. These data indicate that the high intensity, weekly intervention group received almost seven times the number of sessions received by the low intensity group, thus, the study closely resembles a treatment versus no-treatment comparison.

Table 2.5

Treatment Verification Data for LSU/VI Intensity Study

Variable	Low Intensity				High Intensity				P Value
	$\bar{X}$	(SD)	Median	n	$\bar{X}$	(SD)	Median	n	
• Average Length of Intervention in Months	12.1	(1.0)		14	14.2	(4.7)		12	.16
• Total number of sessions attended	3.6	(4.2)	1.5	14	22.2	(15.1)	26.5	12	.000
• Total number of hours of intervention	4.2	(3.9)	3.0	14	29.5	(6.3)	28.8	12	.000
• Intervenor's rating of parent involvement with intervention (range 0 - 45)	——— N/A ———				31.8	(6.1)	33.0	12	- - -
• Average total hours per child of additional therapeutic services received outside of assigned intervention:									
Speech therapy	1.7	(6.4)	.00	14	5.9	(15.5)	.00	11	.42
Motor therapy	2.6	(6.9)	.00	14	11.1	(31.0)	.00	11	.39
Daycare	592.7	(864.6)	80.0	14	101.4	(300.0)	.00	11	.06
Preschool	22.9	(85.5)	.00	14	235.6	(620.7)	.00	11	.29
• Parent ratings of satisfaction w/child's program (range 1 - 5)	3.7	(.5)		7	3.8	(.4)		11	.65

Parent report of time. Various strategies were applied in an attempt to measure parent report of time spent working with their child for those in the weekly intervention. However, accurate information was difficult to obtain, primarily due to the naturalistic learning and teaching approach of the program. Since the interventionists stress incidental learning activities to be integrated into the parent and child's daily routine, a discrete measure of time was not meaningful. Therefore, in lieu of a parent report of time, the interventionists rated the parents using a 9-item, 5-point likert-type scale on their ability to integrate program suggestions at home. Examples of behaviors rated include the parent's ability to facilitate communication, encourage child to use functional vision, respond appropriately to child's initation. The mean score for the high intensity group reflects moderate to good ability of parents to integrate home activities. Since parents in the low intensity group were not expected to be involved in incidental teaching with their children and no instructions were given to them as to how to be involved in such teaching, no measures were taken on this variable for the low intensity group. These data will then serve as potential covariates in subgroup analyses.

Additional services. Given this treatment intensity design, it is important to document any additional services that subjects may be receiving. There are no other services available in the study's geographical area designed to specifically treat children who are visually impaired. However, there are other services available for children with developmental delays. Parents can hire motor and/or communicative disorders specialists, though this is expensive. The Children's Hospital can also provide such therapies to families who receive public assistance. Although there are other infant programs, these do not specialize in serving visually impaired children.

Parents are not restricted from obtaining additional services, though it is unlikely that many such services would be obtained given the lack of opportunities. The completion of the additional service form, described in the treatment verification section, provides the information needed to monitor additional services.

Parents provided information via an interview with the assessment supervisor regarding any services that may have been obtained outside of the research program during pretest and Posttest #1. The purpose of this information is to verify whether or not any observed effects are due to the treatment differences or external factors. Based on the posttest data that have been collected, few subjects are receiving a substantial amount of additional therapeutic services (see Table 2.5). Subjects in the high intensity group reported the receipt of regular preschool in addition to the assigned intervention. However, only one subject was in a preschool on a full time basis. Although subjects in the low intensity reportedly received more daycare than the high intensity group, 75% of the low intensity subject did not receive any daycare. Based on these data, there appear to be no significant differences in the amount of additional services received by subjects in the study.

Parent satisfaction. Given the important role that parents play in receiving services and providing intervention to their children, rating scales were developed to record parent's satisfaction with the services they are receiving based on their group assignments as well as the service provider's impression of the parent's levels of knowledge, attendance, and support. Both forms are completed at posttest time. All obtained information is kept confidential. As shown in Table 2.5, parents from both groups report high satisfaction with the intervention in which they participated.

Evaluations of intervenors. To assist in determining the quality of the intervention, ratings and rankings of the interventionists from both groups were completed by the program supervisors. Intervenors were rated on a 5-point scale in the areas of skills, problem solving, work habits, relationships, communication and attitude. The average score for the intervenors in the high intensity group was 24.2, from a possible total 30 points. There was only one intervenor in the low intensity group, and she received a total score of 26 out of 30. All intervenors were then compared to professionals in similar positions and rated in either the top 10%, top 25%, top 75%, or bottom 25%. Four of the six intervenors in the high intensity intervention were rated in the top 10%, and the remaining two were rated in the top 25% of their peers. These results reflect a quality program as viewed by staff at the Human Development Center.

In addition to these measures of treatment verification, a formal on-site review was conducted in December, 1988. Based on observations of home intervention sessions, reviews of records, and interviews with staff, the program was providing the services as required for the study. A detailed report has been written which should be referred to for more specific information.

Inservice training for staff related to serving children with visual impairments continues via conferences and consultations with model VI programs. Dr. Kay Alicyn Ferrell, a well-respected authority on serving young children with visual impairments, is scheduled to conduct an external program evaluation and inservice training with the HDC staff in October, 1989.

Cost of Alternative Interventions

Analysis of the cost data for the LSU VI project reflects the per child costs for the individualized, weekly home-visit intervention versus the low intensity parent group intervention. These data were collected in June of 1988. Since there have not been any major changes in the interventions, cost data were not collected for this past year. Therefore, the following information is still applicable for 1988-1989.

The cost per child for each alternative was determined using the ingredient's approach described in past reports (see EIEI Base Period Report, 1986). As shown in Table 2.6, each alternative used varying amounts of the indicated resources. The following sections describe the resources and costs used for the weekly home visit program and the parent group meetings.

Table 2.6

Cost per Child for LSU-VI Site (1987-88)

Resources	High Intensity (n=15)	Low Intensity (n=15)
Agency Resources		
Direct services	$2,966	$ 246
Administration		
program	1,482	160
university	642	55
Occupancy	294	8
Equipment	114	8
Transportation	99	0
Materials/supplies	72	18
Telephone	69	1
Sub Total	$5,738	$ 496
Contributed Resources		
Direct services	0	15
Parent time	214	212
Parent transportation	392	105
Sub Total	$ 606	$ 332
Total	***$6,344***	***$ 828***

High intensity, weekly home-visit intervention. Salaries and benefits for direct service and administrative personnel were determined according to their FTE devoted to this aspect of the project. Direct service personnel included two teachers, an occupational therapist, a speech therapist, a physical therapist, a social worker, a developmental pediatrician, and a temporary home-based teacher hired for three months on a consulting basis. Administrative personnel included the program director, the principal, and a secretary. University administration was calculated using the LSU indirect rate of 12.6% for general, departmental, and sponsored projects administration. Parent time was required for participation in home visits, special sessions with the therapists, and for programming assessments. The opportunity cost of parent time ($9/hour) was applied to the average time (23.2 hours) each parent spent on the project in 1987-88. However, the actual value of parent contributions is probably much higher in this program than it appears since the majority of parent contribution was involved via incidental teaching, strategies that are difficult to measure quantitatively. Thus, the actual estimation of value of parent time is most likely an underestimate of what the parents actually did. Occupancy charges, including space, maintenance, utilities, and insurance costs, are based on office leasing costs in the area. Nine dollars per square foot was applied to the 478 square feet used by the program (also pro-rated according to FTE). Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and pro-rated according to the percent FTE worked on the project. Staff travel was based on actual mileage (at $.21 per mile) for home visits. Several parents were reimbursed for travel to the center for weekly intervention services. For parents who were not reimbursed, information was collected via telephone interview on the number of trips made to the center, the round-trip distance, and the approximate time spent in travel. Parent transportation costs were then calculated based on $.21 per mile and the opportunity cost of parent time ($9/hour) spent in travel. The cost of materials and supplies and telephone charges were assessed based on actual usage of these items.

Low intensity, parent group meetings. Direct service costs for the low intensity parent group meetings involved compensation for the group leader on a contractual basis. Various professionals assisted the group leader in addressing specific topics on a volunteer basis. The opportunity cost of their time was determined at $25 per hour for 9 hours. Program administrative cost included a small portion of the site liaison's FTE. University administrative cost was based on the indirect rate as explained above. Parent costs included time spent in the group meetings (based on average attendance), as well as time and expenses associated with travel to the meetings (parent travel information was obtained for this group also by telephone interview). Occupancy cost, calculated at $9 per square foot, (for 47 square feet, pro-rated according to usage by the program) was calculated for the group meeting room at the LSU Eye Center and the site liaison's office. Equipment costs for the group meetings include instructional/curricular materials (Reach Out and Teach) and office equipment and furniture which was valued, annualized, and pro-rated according to FTE. Finally, telephone and materials and supplies costs were assessed based on annual actual usage.

Data Collection

Data on children and their families are being collected using instruments that will yield descriptive information (i.e., demographics) as well as assessing treatment effects. The majority of the instruments are similar to those being used in other Longitudinal Study sites. However, additional posttest data are collected using complementary measures selected to meet the unique characteristics of this visually impaired population. A description of diagnostician requirements is described below, followed by descriptions of the pre- and posttest instruments for this study.

Recruitment, training, and monitoring of diagnosticians. Ten diagnosticians completed extensive training prior to administering the Battelle Developmental Inventory. All of the diagnosticians have bachelor's or master's degrees and extensive experience assessing handicapped infants and children. All the testers are naive to the subject assignment. All but two of the testers are employed by other departments within the Human Development Center and although they are aware that research is being conducted, they do not know the specific details of the study. Shadow-scoring was conducted on 10% of the BDI administrations, averaging 93% interrater agreement. Initially, attempts were made to recruit diagnosticians who were not from the HDC. However, it was difficult to identify outside testers who had skills necessary to test children with visual impairments. Because the expertise of the HDC staff was viewed as being critical in obtaining valid results, and because it was determined that the diagnosticians could be kept uninformed about the specific nature of the study and the group membership of children, it was decided that the use of HDC employees was acceptable. An assessment supervisor, who holds a master's degree in special education, coordinates the scheduling of the testing, collects the family measures, and ensures the quality of the test results via tester reliability checks and double-checking protocols.

Pretest. After children have been identified and assigned to groups based on their visual acuity and screening results, a core pretest battery of measures used across all sites consisting of the Battelle Developmental Inventory, Family

Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III), is administered. (Specific psychometric information regarding these measures can be found in the EIEI 1986-87 annual report.) Demographic information is also obtained via interview with the parent. These measures will be used as covariates in the analysis as well as to investigate whether certain types of families or certain types of children profit more from intervention.

The BDI is administered by a trained diagnostician who is unaware of the child's group assignment. Testing occurs at the Human Development Center in New Orleans, ensuring that the testing setting is the same for all subjects.

The family measures are completed by the parent attending the testing session following the administration of the BDI. Married parents and those with spouse equivalents are also given a copy of the FSS to take home for their partner to complete. To encourage and reinforce parent participation in the assessment process, parents receive a monetary incentive of $20 for completing the pretest battery. The diagnostician scores the BDI and completes a testing report. The diagnostician does not score the family measures. All data are then transmitted to the assessment supervisor. The assessment supervisor maintains copies of all of the protocols for the on-site records and submits the original protocols via certified mail to the EIRI site coordinator within one week.

Posttest #1. Core Posttest measures are collected after children have been in the program for 12 months, and consist of the Battelle Developmental Inventory and the family measures previously described.

Complementary measures include the Early Intervention Developmental Profile (EIDP) (Brown, et al., 1981) the Carolina Record of Individual Behavior (CRIB)

(Simeonsson, 1981), Assessment of Preferential Looking, and videotaped assessment of parent-child interaction.

The EIDP is a criterion- and age-referenced instrument that assesses all major areas of development for children ages birth to 36 months. This instrument was selected for two reasons. The behaviors measured by the EIDP emphasize sensorimotor intelligence based on Piaget's theory of development, thus providing a different perceptive on the child's development compared to the Battelle. Second, the EIDP contains a large quantity of items (299) which are broken down into small age ranges of approximately 3 months each. Thus, the EIDP would potentially provide a more sensitive measure of developmental progress. The EIDP is supplemented with the Preschool Developmental Profile, a version of the EIDP designed for use with children ages 3-6 years of age. This supplement is used with older subjects who did not reach a ceiling on the Early Intervention version. In such circumstances, raw scores are calculated by crediting full points possible on the EIDP and adding any additional points received on the preschool version. The EIDP manual reports validation studies which reflect strong concurrent validity with other standardized measures, i.e., Bayley, as well as strong interrater and test-retest reliabilities.

The EIDP is administered in conjunction with the Battelle Developmental Inventory, with identical items being scored based on the child's BDI performance and unique items being administered following the BDI administration.

The Carolina Record of Individual Behavior (CRIB) is completed on each child based on the diagnostician's clinical impressions when administering the EIDP. The CRIB qualitatively assesses variables that relate to the child's interaction with the environment, a key focus of the high intensity intervention in this study. Such variables include the child's responsiveness to other people and objects, participation with others, reactivity to stimulation, attention span, motivation, and endurance. Additionally, ratings of the child's negative and positive affective behaviors and exploratory behaviors are obtained. The psychometric properties of the CRIB reflect sound test-retest and interrater reliabilities, as well as some degree of construct validity.

The assessment of preferential looking (APL) is conducted at both pre- and posttest time through the LSU Eye Center. During testing, the child is shown stimulus displays containing black-and-white gratings of different spatial frequencies (stripe width). The child's attention to the grating is observed, and monocular as well as binocular acuity estimates are obtained. This method of assessing acuity has been proven to be effective with infants as young as one month of age (Dobson et al., 1986). The pretest preferential looking test was used to stratify according to acuity for group assignment. Preferential looking is also conducted as a posttest measure. Since acuity is one critical variable in the assessment of functional vision, posttest assessments are conducted to assist in judging the effectiveness of the intervention increasing the child's functional use of vision. The preferential looking procedure is a standardized procedure, unlike most functional vision assessments which are non-standardized with a great deal of variability in administration procedures and results.

Videotaped assessment of parent-child interaction is used to measure the effects of visual impairment on parent-child relationships. This was considered to be an important outcome given the dramatic differences in the two treatments being compared. Standardized procedures recorded in a laboratory setting were developed. The videotapes are then sent to coders who have developed systems judged to be sensitive to the desired treatment variables. The Parent-Caregiver Involvement Scale (Farran, Kasari, Comfort, & Jay, 1986), rates maternal behavioral descriptors on a 5-point scale across three dimensions: amount, quality, and appropriateness. Global ratings of (1) availability of parent to child, general acceptance and approval manifested by parent, general atmosphere, enjoyment, and provision of learning environment. The Parent-Child Behavioral Observation System (Marfo, 1989) examines behavior as a dynamic process, measuring both child and parent behaviors and how they interact. Approximately half of the Year 1 posttest parent-child interaction videotapes have been coded and analyzed using the Parent-Child Behavioral Observation System. These measures provide information which is useful in establishing the comparability of the two intervention groups as well as providing information that can be used as covariates in the analysis. Additionally, it can be used to investigate whether certain types of families or children benefit more from the intervention procedures. To date, all of the children who have completed Posttest #1 have been videotaped; scoring of the tapes is proceeding, with only a limited number of scores now available.

Posttest #2. The posttest measures used during Year 2 include the Battelle Developmental Inventory and the previously described family measures. Complementary measures include the assessment of preferential looking and two videotaped assessment procedures.

The previously-described videotaped assessment of parent-child interaction is being collected during Year 2 posttesting. It is intended that this will yield interesting longitudinal data regarding interaction of parents and their visually impaired children compared to their normally sighted peers as well as possibly reveal group differences.

A standardized videotape procedure for assessing exploration and play is also being used for Posttest #2. Both exploration (the skills used to obtain information about novelties in the environment) and play (involving the application of information obtained through exploration) are outcome measures that are not assessed through traditional assessments, and yet are behaviors that have been closely related to cognition, language, and social development. Learning through exploration and play are strategies emphasized by the high-intensity, weekly intervention group. The Play Assessment Scale (Fewell, 1986) is being used to analyze the exploration/free play videotaped scenarios. These videotapes are in the process of being analyzed.

It is anticipated that Year 2 posttest data will be completed on 30 subjects by October, 1990.

Posttest #3. The posttest measures to be used during Year 3 include the Battelle Developmental Inventory and the previously described family measures. A specific measure of orientation and mobility will be more appropriate for subjects upon reaching 5 years of age, therefore, the Peabody Mobility Scale (Harley, Wood, & Merbler, 1980) is being considered. Preferential looking will continue to be assessed at follow-up posttest time.

Dr. Ferrell will be consulted regarding her recommendations for future posttest measures. Approximately 20 subjects will be eligible for Year 3 posttest data by October, 1990.

Results and Discussion

The following section presents results of the study with respect to comparability of the groups on pretest measures, and the preliminary findings of the effects of alternative forms of intervention on measures of child and family functioning. Please note that these results are not complete and discussions are preliminary. No final conclusions should yet be drawn from these data.

Comparability of Groups on Pretest Measures

Table 2.7 presents comparability of groups on pretest measures for all active subjects, Table 2.8 compares those for whom Posttest #1 data have been collected, and Table 2.9 compares those for whom Posttest #2 data have been collected. In reviewing the Battelle pretest scores for all active subjects (pretest data have not yet been coded for the newly-enrolled thirtieth subject), the high intensity intervention group scored lower on all domains of the BDI as well as the total BDI sore, although not significantly so. Given the important role sensori-motor development plays in the visually impaired child's exploration, orientation, and mobility skills, subdomain scores for gross and fine motor scores are also reported. Differences in gross motor scores approached significance ($p \leq .05$), in favor of the low intensity group. There were no statistically significant differences between group scores on the Family Adaptability and Cohesion Scales (FACES III), the Family Inventory of Life Events and Changes (FILE), the Family Support Scale, or the Parenting Stress Index. However, the high intensity group scored statistically significantly lower on the Family Resource Scale ($p \leq .05$), which can be interpreted to mean that the parents in the high intensity group perceive themselves to have fewer resources available, i.e., physical needs, time availability, and external support.

In reviewing posttest scores of subjects for whom Year 1 posttest data have been collected, BDI pretest scores are also higher for the low intensity group, though again these differences only approach significance for the gross motor subdomain. In comparing the scores on the family measures between groups, the mean FRS score remains significantly lower; therefore, the FRS was considered as a covariate in the analyses of posttest data.

Table 2.7
Comparability of Groups on Pretest Measures
for LSU/IV Intensity Study

Active Subjects Enrolled by July 1, 1989

Variable	Low Intensity				High Intensity					
	$\overline{X}$	(SD)	%ile	n	$\overline{X}$	(SD)	%ile	n	p Value	ES[$]
• Age in months at Pretest	15.2	(9.8)		16	14.1	(12.5)		13	.80	-.11
• Battelle Developmental Inventory (BDI)+										
DQs for:										
Personal Social	71.1	(22.4)		16	69.5	(33.5)		13	.48	-.28
Adaptive Behavior	64.3	(19.0)		16	59.0	(39.7)		13	.37	-.32
Gross Motor	85.7	(18.6)		16	62.9	(28.0)		13	.06	-.67
Fine Motor	66.3	(9.7)		16	54.4	(17.8)		13	.31	-.38
Motor Total	76.4	(28.0)		16	63.2	(34.7)		13	.11	-.57
Communication	77.2	(15.0)		16	60.2	(29.1)		13	.37	-.38
Cognitive	61.6	(11.8)		16	48.8	(29.1)		13	.24	-.41
TOTAL	72.6	(93.0)		16	59.6	(27.3)		13	.26	-.42
• Parenting Stress Index (PSI) Percentile Rank@#										
Child Related (range 47 to 235)	102.5	(23.24)	61	16	97.2	(10.7)	45	13	.42	+.23
Other Related (range 54 to 270)	122.0	(17.5)	52	16	112.7	(16)	36	13	.16	+.53
TOTAL (range 101 to 505)	224.4	(35.0)	56	16	210.39	(21.1)	37	13	.26	+.40
• Family Adaptation and Cohesion Evaluation Scales (FACES)*#										
Adaptation (range 0 to 26)	4.2	(4.2)		16	5.1	(2.5)		13	.49	-.21
Cohesion (range 0 to 30)	4.3	(3.6)		16	5.9	(2.9)		13	.22	-.44
TOTAL (range 0 to 80)	6.9	(4.3)		16	8.2	(2.6)		13	.33	-1.30
Discrepancy	8.8	(5.6)		16	10.5	(8.1)		13	.49	-.30
• Family Resource Scale (FRS) &%	131.3	(10.4)	73	16	115.3	(17.6)	37	13	.01	-1.54
• Family Index of Life Events (FILE)~#	8.1	(5.5)	55	16	10.6	(6.0)	34	13	.24	-.45
• Family Support Scale (FSS)&%	28.9	(11.9)	54	16	28.4	(10.7)	50	13	.91	-.04

+ Statistical Analyses for BDI Scores were conducted using raw scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

@ A low raw score and/or a low percentile score indicates lower stress level.

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best (see appendix A for details) and positive ESs indicate that the experimental group scored closer to "ideal."

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

% No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

~ A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

$ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

Table 2.8
Comparability of Groups on Pretest Measures
for LSU/IV Intensity Study

**Subjects Included in Year #1 Posttest
by July 1, 1989**

Variable	Low Intensity				High Intensity				P Value	ES[$]
	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n		
• Age in months at Pretest	15.6	(10.4)		14	13.6	(13.0)		12	.67	-.19
• Battelle Developmental Inventory (BDI)[+]										
DQs for:										
Personal Social	69.7	(26.3)		14	69.9	(35.0)		12	.42	-.33
Adaptive Behavior	61.3	(36.0)		14	59.3	(41.4)		12	.35	-.35
Gross Motor	85.9	(21.1)		14	65.6	(27.3)		12	.08	-.66
Fine Motor	67.1	(29.2)		14	54.7	(18.5)		12	.27	-.43
Motor Total	76.6	(22.6)		14	65.7	(24.2)		12	.12	-.59
Communication	74.1	(29.4)		14	59.4	(30.3)		12	.34	-.39
Cognitive	61.2	(32.5)		14	47.1	(29.7)		12	.19	-.46
TOTAL	71.3	(27.8)		14	59.6	(28.5)		12	.24	-.45
• Parenting Stress Index (PSI) Percentile Rank[@][#]										
Child Related (range 47 to 235)	100.9	(23.0)	57	14	97.9	(10.8)	47	12	.67	+.13
Other Related (range 54 to 270)	120.9	(18.6)	50	14	112.8	(17.1)	36	12	.26	+.44
TOTAL (range 101 to 505)	221.9	(35.7)	51	14	211.3	(21.8)	38	12	.38	+.30
• Family Adaptation and Cohesion Evaluation Scales (FACES)[*][#]										
Adaptation (range 0 to 26)	4.3	(4.5)		14	5.4	(2.4)		12	.46	-.24
Cohesion (range 0 to 30)	4.3	(3.7)		14	5.9	(3.0)		12	.26	-.43
TOTAL (range 0 to 80)	7.1	(4.4)		14	8.4	(2.5)		12	.36	-.29
Discrepancy	8.3	(5.2)		14	11.3	(8.0)		12	.27	-.58
• Family Resource Scale (FRS)[&][%]	132.4	(10.8)	75	14	109.8	(23.0)	35	12	.01	-.209
• Family Index of Life Events (FILE)[~][#]	7.6	(5.1)	55	14	10.8	(6.3)	34	12	.17	-.63
• Family Support Scale (FSS)[&][%]	29.2	(12.3)	54	14	28.3	(11.2)	50	12	.85	-.07

[+] Statistical Analyses for BDI Scores were conducted using raw scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best (see appendix A for details) and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[~] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[$] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

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Table 2.9
Comparability of Groups on Pretest Measures
for LSU/IV Intensity Study

Subjects Included in Year #2 Posttest
by July 1, 1989

Variable	Low Intensity $\overline{X}$	Low Intensity (SD)	Low Intensity %ile	Low Intensity n	High Intensity $\overline{X}$	High Intensity (SD)	High Intensity %ile	High Intensity n	P Value	ES[$]
• Age in months at Pretest	17.3	(11.3)		9	20.1	(13.7)		7	.66	+.25
• Battelle Developmental Inventory (BDI)[+]										
DQs for:										
Personal Social	67.1	(28.5)		9	49.7	(19.1)		7	.80	-.13
Adaptive Behavior	63.4	(36.9)		9	47.3	(35.9)		7	.72	-.18
Gross Motor	90.8	(17.8)		9	47.5	(18.5)		7	.29	-.52
Fine Motor	73.1	(33.3)		9	48.1	(20.7)		7	.57	-.28
Motor Total	79.8	(25.2)		9	50.3	(18.0)		7	.37	-.45
Communication	77.2	(36.5)		9	49.7	(34.2)		7	.69	-.22
Cognitive	66.4	(36.0)		9	37.1	(27.3)		7	.39	-.39
TOTAL	71.1	(33.3)		9	45.7	(26.2)		7	.38	-.28
• Parenting Stress Index (PSI) Percentile Rank[@#]										
Child Related (range 47 to 235)		(18.8)	35	9	101.3	(11.6)	57	7	.28	-.48
Other Related (range 54 to 270)	120.7	(22.7)	50	9	113.1	(17.7)	36	7	.48	+.33
TOTAL (range 101 to 505)	212.9	(37.3)	39	9	214.4	(22.2)	40	7	.93	-.04
• Family Adaptation and Cohesion Evaluation Scales (FACES)[*#]										
Adaptation (range 0 to 26)	3.5	(3.6)		9	5.8	(2.3)		7	.16	-.64
Cohesion (range 0 to 30)	4.1	(3.7)		9	4.9	(3.5)		7	.66	-.22
TOTAL (range 0 to 80)	6.1	(4.2)		9	8.1	(3.2)		7	.33	-.48
Discrepancy	8.4	(5.2)		9	8.7	(6.6)		7	.93	-.06
• Family Resource Scale (FRS)[&%]	135.4	(11.9)	79	9	113.1	(21.4)	40	7	.02	-1.87
• Family Index of Life Events (FILE)[~#]	7.7	(5.5)	55	9	9.6	(5.3)	40	7	.50	-.35
• Family Support Scale (FSS)[&%]	32.9	(11.4)	69	9	30.0	(13.7)	57	7	.65	-.25

[+] Statistical Analyses for BDI Scores were conducted using raw scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best (see appendix A for details) and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[~] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[$] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Differences between groups on Battelle pretest scores are less dramatic in comparing subjects included in Year 2 posttest analysis, with the high intensity group again scoring lower. On the family measures, subjects in the high intensity group again scored significantly lower on the Family Resource Scale. Scores on the adaptability domain of the FACES III approach statistical significance in favor of the low intensity group. The selection of covariates when analyzing Year 2 posttest results will reflect these differences in scores for the low and high intensity groups.

Subject attrition. As of July 1, 1989, six subjects have dropped prior to the collection of Year 1 posttest data. Four subjects were dropped from the study based on the parent's decision to no longer participate. One subject was disqualified based on the severity of other handicapping conditions. One subject died following prolonged hospitalization. There are, thus, 30 active subjects at the present time.

Data for key demographic and pretest variables for those who remained in the study and those who dropped out of the study are reported for children in each group in Table 2.10. As can be seen, those who dropped out for each group are quite similar to those who remained in, except for the income variable. Since there are so few children who have dropped out of the study, the test of statistical significance is not particularly meaningful even though it is recorded in the table. These data seem to suggest, however, that attrition which has occurred thus far has not substantially effected the results of the study.

Table 2.10
LSU/VI Intensity Study Attrition Comparison

		Group								ANOVA				
		Standard Intensity				High Intensity				Group		Study Status		Group by Status
Variable		X	(SD)	%	n	X	(SD)	%	n	ES[$]	P	ES[$]	P	P
CA at Pretest	IN	15.2	9.8		16	14.1	12.5		13		.62		.12	.47
	OUT	3.5	.71		2	9.8	8.8		4					
Total PSI	IN	224.4	35.0		16	210.4	21.1		13	+.29	.97	+.18	.80	.31
	OUT	213.5	12.0		2	228.5	32.9		4					
Education Mother	IN	13.1	1.8		16	12.8	2.7		13	-.09	.92	.29	.52	.70
	OUT	12.0	.00		2	12.5	1.7		4					
Education Father	IN	13.4	3.0		13	13.1	3.4		11	-.14	.53	.48	.49	.67
	OUT	13.0	1.41		2	11.5	1.0		4					
Income	IN	$24,500	17,585		16	$28,885	(27,910)		13	-.01	.58	.55	.37	.33
	OUT	$22,250	17,324		2	$ 9,500	(4,950)		4					
FRS	IN	131.9	10.5		15	111.3	22.6		13	-.49	.03	.13	.20	.79
	OUT	140.5	5.0		2	124.3	21.7		4					
Hours Daycare	IN	3.54	3.9		13	1.6	2.9		11	-.60	.02	-.56	.06	.12
	OUT	12.00	17.0		2	2.5	5.0		4					
BDI TOTAL DQ	IN	73.0	26.2		16	60.0	27.3		13	-.39	.98	.71	.11	.33
	OUT	63.0	53.0		2	69.2	36.0		4					

[$] Effect Size is defined here as the difference between groups (High Intensity minus Low Intensity) on the $\bar{X}$ scores, divided by the pooled standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Data are presented for children who have received testing immediately following one year of intervention followed by children who have been tested two years from the date of pretest. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Results of Posttest #1. Table 2.11 summarizes the posttest data for both low and high intensity subjects who have received the prescribed intervention

Table 2.11
Year One Posttest Measures of Child Functioning for Alternative Intervention Groups for LSU/VI Study

Variable	Covariates&	Low Intensity				High Intensity						
		X̄	(SD)	Adj. X̄	n	X̄	(SD)	Adj. X̄	n	ANOVA F	ES$	P Value
Average length of intervention in months		12.1	(1.0)		14	14.2	(4.7)		12		+.74	.16
Age in months at posttest		28.7	(10.8)		14	26.5	(14.0)		12		-.20	.66
Battelle Developmental Inventory (BDI) *	BDI Gross Motor DQ											
Personal-Social		88.2	(24.9)	78.8	14	77.4	(27.5)	86.7	12	.69	+.32	.42
Adaptive Behavior	Family Resource Scale	82.9	(21.1)	76.0	14	81.5	(28.4)	88.3	12	1.76	+.58	.20
Fine Motor		77.5	(30.1)	70.1	14	69.5	(30.3)	76.8	12	.36	+.22	.56
Gross Motor		84.4	(24.2)	78.7	14	59.1	(25.6)	64.8	12	1.93	-.57	.18
Communication		89.8	(24.0)	84.4	14	80.5	(25.5)	85.9	12	.02	+.06	.90
Cognitive		77.5	(26.7)	68.5	14	69.7	(28.3)	78.8	12	.98	+.39	.33
TOTAL		85.3	(21.1)	78.4	14	77.2	(25.4)	84.0	12	.46	+.27	.50
EIDP+												
Gross Motor		70.9	(19.7)	67.7	14	54.7	(13.9)	57.8	12	1.32	-.50	.26
Fine Motor		37.5	(19.9)	34.6	14	27.8	(12.4)	30.7	12	.21	-.20	.65
Self Care		39.4	(15.1)	36.0	14	32.7	(12.5)	36.1	12	.00	.01	.99
Cognitive		38.2	(18.2)	34.7	14	25.8	(10.2)	29.4	12	.52	-.29	.48
Social		38.1	(14.7)	34.7	13	30.7	(10.9)	34.0	12	.01	-.05	.92
Language		41.5	(17.1)	37.2	13	27.0	(14.0)	31.3	12	.63	-.35	.43
CRIB												
Social Orientation& (range 0 - 9)		7.9	(1.4)	75.0	14	7.6	(1.7)	8.0	12	.57	+.36	.46
Participation (range 0 - 9)&		6.6	(2.0)	6.0	14	6.3	(2.1)	6.9	12	1.20	+.45	.29
Reactivity (range 0 - 5)@		.3	(.8)	.5	14	.3	(.5)	.2	12	1.01	+.38	.33
Attention (range 0 - 5)@		.8	(.8)	.9	14	.9	(.9)	.9	12	.00	.00	.99
Responsiveness@ (range 0 - 5)		.2	(.4)	.3	14	.3	(.5)	.2	12	.14	+.03	.71
Negative Affect ∞ (range 0 - 16)		4.4	(3.5)	5.3	14	3.7	(3.2)	2.8	12	.34	+.71	.08
Positive Affect ∞ (range 0 - 8)		4.2	(2.1)	3.8	14	2.6	(1.1)	3.0	12	1.04	-.38	.32
Exploration (range 0 - 12)∞	↓	3.6	(1.5)	3.3	14	5.3	(2.1)	5.6	12	6.6	+1.5	.02
											X̄ ES = +.11	

* Statistical Analyses for BDI scores were conducted using a Development Quotient (DQ) by dividing the "Age Equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

$ Effect size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X̄ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Analyses for the Early Intervention Developmental Profile are based on raw scores for the number of correct responses.

& Scores are based on a 9-point range with 1 as the most basic level and 9 the most advanced; therefore, high scores are best.

@ Scores are based on the "ideal" score repored in the manual. A score of "0" is best, and positive ESs indicate that the high intensity intervention group scored better.

∞ Low scores for negative affective behavior are best, and high scores for positive affective behavior and exploration are preferred.

for one year. As shown in the table, 26 subjects have completed Year 1 posttesting as of July 1, 1989.

Analyses of covariance were conducted for the BDI scores using the gross motor DQ and the Family Resource Scales, two scores on which the two treatment groups differed at pretest time and two scores which correlated with outcome variables. Analysis of the BDI posttest data show that the adjusted means for most BDI domains and the total score were greater for the high intensity group, although these differences were not statistically significant (at $p \leq .05$ level). The mean for the gross motor subdomain was lower for the high intensity group, although again these differences were not significant.

The Early Intervention Developmental Profile scores are also reported in Table 2.11. Since this is a criterion-referenced measure, raw scores are reported for major domains as well as the total score using the Battelle gross motor DQ and the FRS as covariates. The means for the low intensity group were higher, though there were no significant differences in mean scores between groups on any of the domains.

Scores for the Carolina Record of Individual Behavior are reported for selected domains based on the ability to provide unique information as well as those most pertinent to the study. Scores for social orientation (reflects the child's responsiveness to persons in the environment), participation (describes the child's participation with the examiner), reactivity (the ease with which the child is stimulated), attention span (degree of persistence in attending to object, person, or activity), responsiveness to caretaker (degree of contact through eye contact, vocalizations, and/or touch), and positive affect (laughing/smiling) revealed no significant differences between groups. The high intensity group scored significantly better in the area of exploration of objects using the senses (i.e., tactile via hands and mouth, olfactory), and scores neared significant difference in regard to negative affect (crying, avoidance, clinging) in favor of the high intensity group; these variables also reflect the greatest effect sizes of all the child outcome variables reported.

Results of Posttest #2. To date, 16 subjects have completed Year 2 posttesting as of July, 1989. The degree of intervention has varied for subjects between Year 1 and Year 2 posttesting. Of the 7 subjects assigned to the high intensity intervention, 2 subjects continued to receive the prescribed intervention; 4 graduated from the program upon reaching 3 years of age, 3 of whom participated in preschool programs during the year with 1 subject not receiving any intervention due to functioning within normal limits; one subject chose a different intervention program located in their home area. Of the 9 children assigned to the low intensity intervention, 4 continued to participate in the study although their attendance at the group meetings was negligible; 2 of these 4 subjects were enrolled in regular preschools. Five of the nine low intensity intervention subjects have graduated from the study upon reaching 3 years of age; 1 of the 5 participated in a special education program, 2 subjects were in a regular preschool, 1 was enrolled in a Headstart program and 1 received no intervention, again due to performance within normal limits.

Given the various levels of interventions present within the low and high intensity intervention groups, it is difficult to draw a conclusion regarding two years of consistent intervention. Rather, the data in Table 2.12 reflect the long-term effects of one year of the prescribed interventions.

To date, the Battelle Developmental Inventory is the only child outcome measure that has been analyzed due to the small number of posttest data available to date. In reviewing the BDI domain scores, the mean scores were greater for the low intensity group, reflecting overall negative effect sizes.

Table 2.12
Year Two Posttest Measures of Child Functioning for Alternative Intervention Groups for LSU/VI Study

Variable	Covariates[&]	Low Intensity				High Intensity						
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANOVA F	p Value	ES[$]
Average length of Intervention		12.1	(1.0)		9	14.2	(4.7)		7		.16	+.74
Age in months at posttest		42.7	(10.5)		9	46.3	(15.1)		7		.66	
Battelle Developmental Inventory (BDI) *												
Personal-Social	Family Resource Scale BDI Gross Motor Raw	101.9	(18.9)	89.8	9	80.1	(31.2)	92.2	7	1.42	.26	-.51
Adaptive Behavior		99.6	(29.0)	82.4	9	74.1	(29.1)	91.4	7	.14	.72	-.15
Fine Motor		91.0	(10.3)	82.3	9	71.3	(31.7)	80.0	7	1.78	.21	-.53
Gross Motor		87.3	(12.9)	77.5	9	50.0	(25.6)	59.8	7	9.70	.01	-.73
Communication		97.3	(16.8)	87.4	9	74.0	(30.9)	84.0	7	.72	.41	-.38
Cognitive		96.2	(17.4)	87.1	9	68.1	(32.0)	77.2	7	.83	.38	-.38
TOTAL		95.9	(13.0)	84.5	9	70.6	(27.2)	82.0	7	1.9	.20	-.54
											$\bar{X}$ ES = .46	

* Statistical Analyses for BDI scores were conducted using raw scores. For ease of interpretation, a Development Quotient (DQ) was calculated by dividing the "Age Equivalent (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[$] Effect size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the $\bar{X}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

However, only the mean gross motor subdomain scores were significantly different, in favor of the low intensity group.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Data are reported for one year and two years following enrollment. Previously-described procedures were again implemented in the selection of covariates.

Posttest #1. Table 2.13 represents results of analysis involving family functioning measures. One family declined from completing the measures, therefore data from the high intensity group included 11 rather than 12

Table 2.13
Year One Posttest Measures of Family Functioning for Alternative Intervention Groups for LSU/VI Intensity Study

Variable	Covariate**	Low Intensity Group					High Intensity Group					ANCOVA F	p Value	ES$
		$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n			
Average Length of Intervention		12.1	(1.0)			14	14.2	(4.7)			12		.16	.74
Parent Stress Index (PSI)# @														
Child Related Range (50 to 235)	BDI Gross Motor DQ	108.1	(16.5)	111.1	76	14	113.5	(21.0)	110.4	75	11	.01	.94	+.04
Parent Range (47 to 270)	Family Resource Scale	125.3	(26.0)	123.4	55	14	125.5	(21.3)	127.4	61	11	.10	.76	-.15
Total Range (101 to 505)	↓	233.4	(32.6)	234.6	67	14	239.0	(38.9)	237.8	69	11	.03	.86	-.10
Family Adaptation and Cohesion Evaluation Scales (FACES)*#														
Adaptability Range (0 to 26)		7.6	(6.7)	7.2		14	2.6	(2.7)	3.1		11	2.32	.14	+.61
Cohesion Range (0 to 30)		4.2	(2.7)	4.2		14	4.2	(4.0)	4.2		11	.00	.98	0.00
Total Range (0 to 80)		9.2	(6.5)	9.0		14	5.5	(4.1)	5.8		11	1.12	.29	+.50
Discrepancy		10.7	(8.3)	9.9		14	6.1	(5.4)	6.9		11	.68	.42	+.40
Family Resource Scale (FRS)&%		129.1	(11.7)	121.5	57	14	111.4	(21.2)	119.0	51	11	.15	.70	-.21
Family Support Scale (FSS)&%		36.5	(10.2)	34.4	71	13	29.9	(8.8)	32.1	76	11	.24	.63	-.23
Family Index of Life Events (FILE)#**		7.3	(4.6)	9.3	47	14	10.2	(9.1)	8.1	55	11	.13	.72	+.26
													$\overline{X}$ ES =	+.11

#Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

@A low raw score and/or a low percentile score indicates lower stress level.

*Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best (see appendixA for details) and positive ESs indicate that the experimental group scored closer to "ideal."

&Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

%No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

**A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

$Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

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subjects. Analyses of covariance were performed using BDI gross motor computed DQ and Family Resource Scale. No significant differences were found between groups on any of the family measures. However, there is a trend toward differences between groups on the adaptability domain of the FACES III, in favor of the high intensity group. In reviewing effect sizes based on the measures of stress, negative effect sizes resulted for the Parenting Stress Index, yet a positive effect size was reached on the Family Inventory of Life Events and changes.

Analysis of parent-child interaction videotapes. The Multi-pass scheme (Marfo, 1989) was implemented for the coding of the parent-child interaction tapes. Multi-pass was designed primarily to study the notion of maternal directiveness in relation to the responses of parent and child to one another. The behavior count section of Multi-pass utilizes an event-based coding system targeting four types of parental directive behavior: 1) turn taking control, 2) response control, 3) topic control, 4) inhibitive/intrusive control. The system also allows for a close analysis of verbal directiveness (i.e., imperative directives versus embedded/implied directives) and six parental instructional behaviors. Another portion of Multi-pass consists of a qualitative rating system, however, this was not employed by the coders. Videotapes were sent directly to the author of Multi-pass to ensure accurate coding. Analysis of the raw data was conducted by the EIEI site coordinator.

Multi-pass provides data on 40 specific behaviors, and therefore related variables were combined to reflect the four dimensions of parental directive behavior. Additionally, dimensions of child responsiveness were also developed by combining related behaviors.

Table 2.14 reports the results of preliminary analysis of Multi-pass comparing the low versus high intensity groups. To date, 14 of the 26

Table 2.14

Year One Posttest Measures of Parent-Child Interaction for Alternative Intervention Groups for LSU/VI Intensity Study

	Low Intensity Group			High Intensity Group				
Variable	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	p Value	ES[$]
MULTI-PASS*								
Parent								
+Turn taking Control	1.64	(.38)	7	1.67	(.37)	7	.86	-.08
+Response Control	5.58	(1.86)	7	4.35	(1.57)	7	.21	+.66
+Inhibitions/Intrusions	.52	(.17)	7	.25	(.05)	7	.004	+1.60
+Imperatives/Implied Directions	2.90	(1.05)	7	2.71	(2.71)	7	.68	+.20
Instructional behaviors	4.43	(2.34)	7	3.82	(.98)	7	.56	-.61
Child								
+ Response Control	.59	(.53)	7	.27	(.24)	7	.18	+.60
Compliance with Inhibitions	.32	(.23)	7	.17	(.08)	7	.13	+.70
Compliance with Directions	1.88	(.76)	7	1.46	(.78)	7	.33	+.60
							$\overline{X}$ ES = +.46	

*All scores reflect frequency of occurrences divided by number of minutes recorded.

+Higher scores associated with higher level of directiveness.

$ Effect Size (ES) is defined here as the difference between the groups (High Intensit minus Low Intensity) on the X score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Posttest #1 videotapes have been coded. Due to this small number of subjects, only t-tests are reported rather than analysis of covariance. Results show that the groups did not differ significantly in regard to turn taking control of parent (degree of balance in participation between parent and child), response control parent (extent to which parent behavior is directed at attempting to get the child to respond), response control of child (extent to which child behavior is directed at attempting to get the parent to respond), frequency of parent imperative, embedded, implied directives, frequency of child's compliance with these directives, frequency of parent instructional behaviors (labels, expands, gives and requests information, models, and reinforces). There was a statistically significant difference between groups on the frequency of parental inhibitions and intrusions (verbal or nonverbal behavior directed at stopping the child from engaging in an activity or behavior that is not considered to be dangerous/undesirable, or imposing the parental agenda at the cost of the child's interests), in favor of the high intensity group ($p \leq .05$). However, it should be noted that this was a very low frequency variable, thereby diminishing its statistical significance. Associated with the frequency of parental inhibiting behaviors is the frequency of child's compliance with parental inhibitions. Mean scores for the high intensity group were lower (though not significantly so), most likely due to the lower number of parental inhibitions which were directed toward them.

Posttest #2. The core family measures were again administered two years from date of pretest. The parents of one subject again refused to complete the family measures, therefore data on only 6 of the 7 subjects from the high intensity intervention were available for analysis. As depicted in Table 2.15, no significant differences were found between intervention groups on any of the family measures.

Subgroup Analysis

A subgroup analysis was performed applying a two-way analysis of variance by intervention group and by severity of vision loss (acuity worse than 20/800 versus acuity better than 20/800), using Battelle DQ scores as dependent variables. No significant interactions were found between intervention and degree of vision loss. However, as would be expected, Battelle scores were influenced by degree of vision loss alone, with children whose acuity was worse than 20/800 receiving lower scores.

The effects of socioeconomic status on degree of child progress was also analyzed, applying a two-way analysis of variance by intervention and by income

Table 2.15

Year Two Posttest Measures of Family Functioning for Alternative Intervention Groups for LSU/VI Intensity Study

		Low Intensity Group					High Intensity Group							
Variable	Covariate∞	$\overline{X}$	(SD)	AdjX	%ile	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%ile	n	ANCOVA F	p Value	ES$
Average length of Intervention		12.1	(1.0)			9	14.2	(4.7)			7		.16	+.74
Parent Stress Index (PSI)#@	BDI Gross Motor DQ													
Child Related Range (50 to 250)		98.1	(10.1)	98.7	50	9	110.8	(22.8)	110.3	75	6	1.36	.27	-1.15
Parent Range (54 to 270)	Family Resource Scale	122.7	(19.2)	127.7	63	9	126.0	(18.74)	120.9	50	6	.39	.55	+.35
Total Range (101 to 505)		220.8	(27.11)	226.6	59	9	237.3	(37.3)	231.5	64	6	.07	.79	-.18
Family Adaptation and Cohesion Evaluation Scales (FACES)*														
Adaptability Range (0 to 26)		2.9	(3.6)	3.8		9	3.6	(2.0)	2.7		6	.32	.58	+.31
Cohesion Range (0 to 30)		3.3	(1.5)	4.0		9	5.3	(5.0)	4.6		6	.06	.81	-.48
Total Range (0 to 80)		5.1	(2.8)	6.4		9	6.9	(4.5)	5.6		6	.14	.72	+.29
Discrepancy*		8.6	(4.4)	9.0		9	8.7	(2.0)	8.3		6	.07	.80	+.16
Family Resource Scale (FRS)&%		131.6	(16.1)	122.0	57	9	118.0	(27.5)	127.5	68	6	.26	.62	+.34
Family Support Scale (FSS)&%		33.0	(7.2)	30.3	57	9	33.0	(13.6)	36.0	75	6	.71	.42	+.79
Family Index of Life Events (FILE)∞#		6.0	(3.4)	5.9	69	9	9.2	(5.3)	9.3	47	6	1.32	.28	-1.0
													$\overline{X}$ ES =	-.05

#Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

@A low raw score and/or a low percentile score indicates lower stress level.

*Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best (see appendixA for details) and positive ESs indicate that the experimental group scored closer to "ideal."

&Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

%No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

∞A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

$Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[income greater than $13,000 (the median income) versus income less than 13,000]. Results reflect a trend toward the high intensity group having a greater impact on BDI scores for families with incomes more than $13,000 compared to families of income less than $13,000, however, only one of the five domains (adaptive) reached a level of significance ($p \leq .03$).

As data become available on more subjects, further subgroup analyses are planned to investigate the relationship between intervention and presence of other handicapping conditions/developmental delay. Analyses of the effects of additional services on child functioning is also warranted. There was also considerable variability in the attendance of subjects in both groups; therefore, the amount of intervention received will also be considered in future analysis.

Conclusions

To date, 26 of the 30 active subjects have completed Year 1 posttesting. Based on this partial compilation of posttest results, it appears that there are mixed results regarding the impact of the high versus low intensity intervention on measures of child and family functioning. Although not statistically significant, positive effect sizes resulted for the Battelle Developmental Inventory. This positive trend was contradicted by the Early Intervention Developmental Profile for which negative effect sizes resulted. One significant difference did appear when assessing behaviors that are less developmentally-based, i.e., the CRIB; specifically, the high intensity group scored significantly better in regard to exploring with other senses, a skill that is important for children with visual impairments.

In regard to effects of alternative interventions on measures of family functioning collected at Year 1, effects of the interventions are also mixed.

The high intensity intervention appeared to positively effect the family's overall functioning and level of satisfaction, yet levels of stress and utility of external resources and supports were not positively changed. Future subgroup analyses may yield useful information regarding the effects of different interventions on families with particular characteristics.

Parent-child interaction appears to be a potentially sensitive method of assessing the effects of the alternative treatment, and one that will provide information different from the other outcome measures. However, conclusions cannot be made based on the small number of subjects presently available for analysis.

Any conclusions based on Posttest #2 data would be premature, given the small number of subjects who were included in the analyses. Thirty subjects will have completed Posttest #2 data by October, 1990, at which time results of analyses will be more meaningful.

Although the results of this study are only based on 26 children (a relatively small number of children for intervention studies such as this), it's important to note that most of the previous experimental studies of the effects of early intervention with visually impaired children were also based on small numbers. The findings of this study are substantially different than those from previous studies, but it is important to reiterate the reasons for why these discrepancies may have occurred. First, this study was based on a randomized experiment; few of the previously mentioned studies involved a control group for comparison. Furthermore, this study used diagnosticians who were uninformed as to subject assignment to assess child outcome variables, and efforts were also undertaken to ensure that the expected treatments were delivered as planned. These mixed findings of the effects of the interventions must also be evaluated in light of the cost of delivering the high intensity intervention.

As noted at the beginning of this report, these findings should be regarded as preliminary and further data are in the process of being collected. At this point, however, the data raise important questions about the way in which early intervention services are provided to visually impaired children. Two possibilities are immediately apparent. First, it may be that visually impaired children, even at this young age, need much more comprehensive intervention services. Perhaps to achieve substantial benefit, it is necessary to have intervention programs which deliver professionally mediated intervention several times weekly to the children. This could be done in either home-based or center-based settings. A second possibility is that perhaps the focus of the intervention should change to provide primary support and assistance to the family rather than emphasize developmental therapy directed toward the child. Although the high intensity intervention in this study is very consistent with what is delivered in most early intervention programs for visually impaired children, it is possible that different findings may result through the application of completely different forms of interventions. This study will continue to respond to the issues related to early intervention as more data are collected, and it is anticipated that additional questions will also be raised, requiring further investigation.

Future Plans

Plans for fiscal year 1989-1990 involve the continuation of the two interventions as described. New subjects will continue to be enrolled until October of 1989, ensuring that any new subjects will be able to participate in one year of the prescribed intervention.

The selection of outcome measures for Year 3 will be addressed, and final decisions will be made by December of 1989. It appears that the Battelle will continue to be appropriate for Posttest #3, considering the ages of the children in the study. One critical issue related to the selection of complementary measures is the availability of testers trained in the administration of measures for the visually impaired (i.e., Peabody Mobility Scales). Contacts will be made with staff from the University of New Orleans and the Lighthouse for the Blind to identify testers, if necessary.

SMA/LAKE McHENRY PROJECT

Project #3

COMPARISON: Severely Handicapped Children--Once per week versus three times per week services.

LOCAL CONTACT PERSON: Dr. Alice Kusmierek, Coordinator, Interagency Project for Early Intervention.

EIRI COORDINATOR: Stacey E. McLinden, Ph.D., Assistant Professor, University of Wisconsin--Milwaukee

LOCATION: Flossmoor, Illinois (Chicago Suburb)

DATE OF REPORT: 10-9-89

Rationale for Study

Although popular support for early intervention efforts has been strong, research on early intervention effectiveness has shed little light on important issues such as the relative effectiveness of various program intensities (White & Casto, 1985). The research base which has dealt with moderately to severely handicapped young children is particularly sparse. It is only within the last 12 years, since the advent of P.L. 94-142, that children with significant impairments have been systematically included in early intervention programs (Bailey & Bricker, 1984). Very little is thus known about the optimal intensity of services to be provided to this group of children.

Review of Related Research

The implementation of P.L. 99-457, Amendments to the Education of the Handicapped Act of 1986, has focused attention on early intervention services in general and on services to infants and toddlers in particular. As states are developing plans to service the youngest population of children with handicaps, questions are being raised regarding the most appropriate types of services to be provided. Peterson (1987) has discussed seven specific decisions which must be made regarding the development of a service delivery program, including who will be the target of service (e.g., child, mother, father, both parents, family), at what age services should begin, what services should be provided, in what setting the intervention program will be provided, who will be the primary intervention agent, in what social context services will be provided (e.g. individual or group program), and which agencies will provide services.

Although certain aspects of service delivery will be determined by practical and political forces--i.e., decisions regarding the agencies through which services will be delivered will be made at a state level based on the ability of different state agencies to perform this role--decisions regarding other aspects of service delivery can be facilitated by the availability of research data on the effectiveness of various approaches. Such data are particularly important in light of the cost issues--i.e., the cost of human as well as monetary resources-- which various approaches to service delivery entail. However, the overriding issue should be, and is, how the services which are provided to infants and toddlers and their families can maximize their development.

Decisions regarding the type of services to be provided are particularly important, as such decisions are directly related to both the cost of intervention as well as its effectiveness. Although a myriad of research questions on the relative costs and effects of different types of services can be asked, a very basic question is, "How many hours of service should be provided each week to maximize child and family functioning?"

According to Bricker (1986), one hour per week of individual services is a common service delivery model for children under age three, in either a home-based or center-based setting with the child and primary caregiver present. This model has face validity from both a cost and a practical perspective--i.e. it makes sense to provide a relatively low intensity of services to young children whose skill development needs are relatively restricted as a result of their age, as well as to recognize the parent's responsibility as a caretaker first and an intervention agent second. However, given the impetus of increased funding for infant and toddler services, the question of efficacy must be raised with regard to the appropriateness of such a relatively low intensity of service. If resources are to be used to serve this population, then would an increase in the frequency with which services are provided result in greater gains in both child and family functioning?

Overview of Study

The purpose of this study was to address the question of the relative efficacy of different intensities of early intervention services for handicapped children under age three. The study involved an experimental comparison of the costs and effects of serving children on either a one hour per week or a three hour per week basis. Three hours per week were selected as the greater level of intensity of services based on a number of factors. First of all, even a more intensive level of service must take into account the factors of child skill development needs as well as the parent's role in intervention. While 20 hours of individual services per week provide a very clear cut intensity comparison, it not only dramatically increase the parent's role as an intervention agent, but would be difficult to justify given the types of skills and rate of skill development expected of any child under age three. Costs of providing such services on an individual basis would also be exorbitant. One hour three times per week, however, represents a level of service which is more intense than once per week, yet is not so intense that the parent's role is changed or expectations for child gains are exceeded. It was hypothesized that three times per week services would not only maximize the opportunity to intervene with particular child skills, but would increase the opportunity for program staff to provide family-oriented services as specified by P.L. 99-457.

To examine the relative effectiveness of once per week versus three times per week services, a number of measures of child and family functioning were selected for use in this study. Some of these measures have been administered at pretest, one year, and again at two years following the child's enrollment in the study. Other measures were administered at the first or second posttest only. To assess intervention effects on the child, the Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984), Bayley Scales of Infant Development (Bayley, 1969), the Wisconsin Behavior Rating Scale (Song & Jones, 1980), and the Scales of Independent Behavior (Bruininks, Woodcock, Weatherman, & Hill, 1984) were administered. The BDI, which was administered at pretest and during each posttest year, was selected to assess the child's overall development as well as skill development in five domains of functioning: Personal/Social, Adaptive, Motor, Communication, and Cognitive. The BDI allows for direct assessment and observation of child skills as well as use of parental report. The scale was developed for use with children between birth and 8 years of age, thus facilitating the assessment of children of different ages on a longitudinal basis. The Bayley Scales, which were administered at the one year posttest, were selected to provide a more fine-grained analysis of the child's cognitive and motor skills. The Bayley Scales have also been used extensively in previous studies of early intervention, and thus their use would facilitate comparison of the results of this study to other work. The Wisconsin Behavior Rating Scale, administered at pretest and at one year posttest, is completed by a specialist or educator who is familiar with the child, and thus allows for another source of data to be used to assess child skill development. The Early

Development Scale (ED) and the Short Form (SF) of the Scales of Independent Behavior (SIB) were administered at Year Two posttest in order to provide additional data on the extent to which the interventions impacted the subjects' adaptive behavior. Both the SIB ED and SF scales were administered because there is evidence to suggest that the age scores obtained on these scales may be significantly different for this population (Goldstein et al., 1987).

A battery of instruments which would allow for the assessment of the effects of intervention on the mothers and fathers of subjects was also administered. These instruments were selected to address criticisms of previous research in which the focus of assessment was restricted to child outcome measures (Mott et al., 1986). The instruments selected for use in this study were based on reviews of the literature on expected family outcomes, and variables with the potential to mediate family outcomes, and thus included measures of parent stress, social support, resources, family functioning, and life events and changes. The specific instruments included the Parenting Stress Index (Abidin, 1986), the Family Support Scale (Dunst, Jenkins, & Trivette, 1984), the Family Resource Scale (Dunst & Leet, 1985), the Family Adaptability and Cohesion Evaluation Scales (Olson, Portner, & Lavee, 1985), and the Family Inventory of Life Events and Changes (McCubbin, Patterson, & Wilson, 1983). The Comprehensive Evaluation of Family Functioning Scale (McLinden, 1988), a new scale developed to assess the impact of the handicapped child in the family, was also administered to both the mothers and fathers at year two posttest.

Methods

Subjects

A total of 75 children who were served by three different early intervention programs in the Chicago suburbs were included as subjects in the study. Sixty children were posttested at Year One, and 49 were posttested at Year Two. The recruitment, assignment to groups, and demographic characteristics of the subjects are described below.

Recruitment. Subjects were recruited from three intervention programs in the Chicago suburbs. The three programs--South Metropolitan Association (SMA), Lake-McHenry Regional Program (LMRP), and Southwest Cooperative Association (SW Coop)--received funding from the State of Illinois Board of Education from July 1, 1985 through June 30, 1988 to conduct an evaluation of the effectiveness of expanding services to the birth to three population. All three programs had in the past provided once per week intervention services to children under age three, and, as a condition of receiving additional funding from the state, agreed to provide three times per week services to a randomly assigned experimental group, while continuing to provide once-per-week services to other children.

Between January 1, 1986, and June 30, 1987, all children who were referred to any of these three programs were considered for inclusion in the study if they were 24 months of age or less and had either a diagnosed handicapping condition or demonstrated overall developmental delay of 65% or more. A determination of developmental delay was made through a multidisciplinary team assessment conducted by the program as well as through completion of the Wisconsin Behavior Rating Scale by the member of the team assigned as the child's case manager. The age cutoff was included to ensure that all children would have an opportunity to participate in at least one year of early intervention services before moving on to a preschool program operated by the public school system at age three. Referrals who met the criteria were informed of the nature of the research project by program staff and asked to participate in the study. The requirement of random assignment to groups, and the possibility of obtaining three times per week services, was emphasized. It was made clear that a decision not to participate in the study would in no way influence their ability to access the once per week services typically provided by the program.

A total of 75 children and their families agreed to participate and were pretested as subjects in the study. Of these, 15 families dropped out of the research project before Year One posttest data could be collected, and an additional 11 subjects dropped out before completing Year Two posttest. The most common reason for attrition before posttest 1 was a move out of the area (8 subjects). Other reasons included death of the subject (2 subjects), refusal to participate in posttesting (1 subject), or dissatisfaction with the frequency or nature of services provided (4 subjects). Attrition prior to posttest one across groups was relatively equal (7 experimental, 8 control). There was an unequal proportion of subjects from the experimental group (8) who dropped after Year One posttest versus the control group (3). However, the reasons for attrition were similar across groups. Of the eight experimental group subjects who dropped, five moved and three refused to participate in testing. Of the three control subjects who dropped, two moved and one refused to participate in testing. This attrition did not affect the comparability of the groups on any pretest variable except mother's age, which had been close to being statistically significantly different at pretest and at Year One posttest as well. In addition, although there was a statistically significant difference for this variable, it is not practically significant (e.g., there is no reason to believe that a mean age difference of 4.4 years for mothers would have significant influence on the outcomes of the study).

A series of two by two ANOVA'S were conducted to determine whether there were any statistically significant group by subject status (i.e. subjects who dropped versus those that do not) interactions. The dependent variables for these analyses included mother's age, number of hours worked-father, BDI total raw score, PSI total score, number of parents living with child, mother's FSS total score, and FRS total score. A statistically significant interaction effect was found for the FRS total score only. Subjects who dropped out of the expanded intervention group had higher

FRS pretest scores ($\bar{x}$ = 126.7) then did subjects who dropped from the basic intervention group ($\bar{x}$ = 106.0).

Assignment to groups. Subjects were entered into the study on a continuous basis as identified by the programs and randomly assigned to groups by Dr. McLinden. Data on the subject's handicapping condition and/or developmental status as provided by the program and the parent's level of stress as determined by the parent's score on the Parenting Stress Index (PSI) (Abidin, 1986) were used to stratify the subjects prior to random assignment. (A more detailed description of the procedures utilized to randomly assign subjects can be found in the Base Period Report).

Demographic characteristics. Data on the demographic characteristics of all subjects entered in the study as of June 30, 1987, as well as subjects in the experimental and control groups who participated in Year One and Year Two posttesting, are presented in Table 3.1. The total sample can be characterized as predominantly Caucasian and middle class. Most subjects lived in two-parent households in which fathers were employed full time and mothers were the primary caretakers for the child.

Intervention Programs

The two intervention groups received very similar types of service, but differed along the dimension of frequency of services, with the experimental group receiving three times per week services and the control group receiving once per week services. The specific services provided are described below.

Basic intervention (once per week services). Children and primary caretakers group participated in a once per week contact with either an infant specialist (e.g. speech/language pathologist or occupational or physical therapist) or an early childhood special educator. While most contacts occurred at a center-based location,

Table 3.1
Comparability of Groups on Demographic Characteristics for SMA/Lake-McHenry Project

Variable	All Subjects Pretested							Subjects Included in Year #1 Analyses (Based on Pretest Demographics)								Subjects Included in Year #2 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention			P Value	Basic Intervention			Expanded Intervention			P Value	ES	Basic Intervention			Expanded Intervention			P Value	ES
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n			$\bar{X}$	(SD)	(GRP=0) n	$\bar{X}$	(SD)	(GRP=1) n		
• Age of child in months at program entry	13.7	(6.0)	40	12.3	(6.2)	35	.30	13.7	(6.0)	31	12.4	(6.0)	29	.42	-.20	13.6	(6.1)	28	11.3	(5.7)	21	.17	-.36
• Age of mother in years	30.4	(5.8)	38	32.8	(4.9)	34	.06	30.2	(5.3)	31	32.8	(5.1)	29	.06	|.44|	29.7	(5.3)	28	33.1	(5.2)	21	.03	|.59|
• Age of father in years	33.2	(5.7)	35	34.6	(6.8)	34	.35	32.8	(5.5)	28	34.8	(7.0)	29	.25	|.36|	31.4	(5.6)	25	34.4	(5.6)	21	.22	|.37|
• Percent male *	52.5		40	62.9		35	.37	48.4%		31	62.1%		29	.30	|.13|	50.0%		28	61.9%		21	.42	|.18|
• Years of education for mother	13.5	(1.9)	38	13.1	(1.7)	34	.30	13.7	(2.0)	31	12.9	(1.5)	29	.08	-.20	13.8	(2.0)	28	13.0	(1.5)	21	.18	-.40
• Years of education for father	14.1	(2.1)	35	13.7	(2.1)	32	.44	14.3	(2.0)	28	13.7	(2.0)	27	.26	-.28	14.4	(2.0)	25	14.2	(2.1)	19	.65	-.30
• Percent with both parents living at home *	68.4		38	91.2		34	.02	71.0		31	93.1%		29	.03	.35	71.4%		28	90.5%		21	.11	.29
• Percent of children who are caucasian *	77.5		40	94.3		35	.06	80.6		31	96.6%		29	.10	.39	82.1%		28	95.2%		21	.27	.18
• Hours per week mother employed	11.1	(16.7)	38	6.7	(14.1)	33	.24	9.9	(15.9)	31	7.6	(14.9)	29	.57	|.12|	9.7	(15.9)	28	7.2	(14.4)	21	.57	|.11|
• Hours per week father employed	34.8	(15.4)	33	40.9	(9.7)	30	.07	37.0	(14.0)	26	40.8	(10.4)	26	.27	|.17|	38.3	(12.6)	23	40.5	(11.5)	18	.57	|.17|
• Percent of mothers employed as technical managerial or above *	13.2		38	24.2		33	.23	16.1		31	27.6%		29	.29	.13	14.3%		28	28.6%		21	.23	.22
• Percent of fathers employed as technical managerial or above *	36.4		33	33.3		33	.80	38.5		26	32.1%		28	.64	-.18	34.8		23	40.0%		20	.73	-.09
• Total household income	$26,058	(16,439)	34	$28,621	(14,003)	33	.50	$28,321	(16,598)	28	$28,375	(13,829)	28	.99	-.17	$28,400	(17,201)	25	$30,525	(14,170)	20	.66	.05
• Percent receiving public assistance	25.0		32	20.7		29	.70	17.9%		28	20.8%		24	.79	.27	15.4		26	16.7		18	.91	-.03
• Percent with mother as primary caregiver *	96.8		31	96.8		31	1.00	96.0%		25	96.2%		26	.98	.15	95.7%		23	94.7%		19	.89	-.02
• Percent of children in day care more than 5 hours per week*	14.3		28	3.7		27	.18	18.2%		22	4.5%		22	.16	|.08|	15.0%		20	6.3%		16	.42	|.20|
• Number of siblings	1.3	(1.1)	38	1.1	(1.0)	34	.50	1.0	(.84)	31	1.2	(1.0)	29	.57	|.32|	1.0	(0.8)	28	1.1	(1.0)	21	.69	|.13|
• Percent with English as primary language	92.1		38	100.0		34	.10	90.3%		31	100%		29	.09	.24	89.3%		28	100%		21	.13	.04

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0." Percentages are based on the number of valid cases.

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programs did allow the flexibility of conducting some of the contacts in the parent's home. Since the programs did not provide transportation to the children and their parents, the most common reason for providing a home visit was parental lack of transportation to the center. However, home visits were also provided when a particular teaching session could be most effectively accomplished in the home (e.g., when feeding or sleeping behaviors were of concern).

The content of the intervention sessions was directly related to the needs of the specific child and family as specified in the child's Individualized Education Plan (IEP). No specific curriculum was followed unless the individual specialist or educator found that doing so would meet the child and family's specific needs. The specialists and educators thus has a great deal of freedom in determining what was accomplished during the individual sessions. In general, there was a program expectation that the sessions would focus on improving child development in the domains of personal/social, adaptive, motor, language, and cognitive functioning, and that the sessions would also help parents to become intervenors for their child.

Another major goal of the sessions was to provide a forum for parents to discuss issues of concern to them and to help them adapt to the daily demands of caring for a handicapped child. During the first year of the project, funding from the Illinois State Board of Education allowed the programs to hold a number of inservices to provide staff with additional training in providing family-focused intervention services (e.g., Dunst, Trivette, & Deal, 1988). This training emphasized the importance of addressing parent-identified needs as well as strengths in an effort to empower parents to become capable of dealing with the demands of caring for a child with special needs rather than relying solely on professional helpers and helping systems.

Expanded intervention (three times per week services). Children who were assigned to this group participated in three, one-hour contacts per week with a specialist or educator. The content and focus of the sessions were the same as that for the control group. It was expected, however, that the increased staff contact time would allow for a wider range of IEP goals to be addressed, and that the more frequent contact would allow more parent concerns and issues to be incorporated into the treatment sessions.

Optional intervention services. Programs did not formally monitor and report information regarding optional intervention services for the subjects in this study. The one exception is for the psychiatric services provided by the Lake-McHenry program as reported in the analysis of the cost data collected at Year One posttest. These data indicated that the experimental and control groups received relatively equal levels of this service (an average of .87 hours for the experimental group subjects, and 1.08 hours for the subjects in the control group).

Treatment verification. A number of procedures were used to verify that treatment was implemented as intended. Data for Year One are presented in Tables 3.2. and 3.3, and data for Year Two are presented in Table 3.4. An examination of

Table 3.2
Treatment Verification Data for SMA/Lake McHenry Project for Year #1 Posttest

Variable	Basic Intervention Group			Expanded Intervention Group			ANOVA F	ES	P Value
	$\bar{x}$	SD	n	$\bar{x}$	SD	n			
Intervenor Rating of:*									
Parent Attendance	2.52	(.68)	31	2.62	(.56)	29	-.65	.15	.52
Parent Knowledge	2.16	(.69)	31	2.48	(.57)	29	-1.96	.46	.05
Parent Support	2.42	(.67)	31	2.76	(.44)	29	-2.34	.51	.02
Parent Rating of Satisfaction^	24.2	(4.2)	31	23.7	(3.2)	29	.71	-.18	.48
Rating of Intervention+									
Quality of Session	19.9	(8.1)	29	16.1	(7.3)	26	1.79	-.47	.08
Ranking of Intervenor	1.1	(.4)	28	1.2	(.40)	26	-.48	.14	.63
Total # of Sessions Attended	26.9	(6.8)	31	63.7	(16.4)	29	-11.2	5.42	.00
Total # of Sessions Offered	36.3	(4.8)	31	95.9	(13.5)	29	-22.5	12.5	.00
Percent Attendance	74.1	(16.5)	31	66.8	(14.8)	29	1.80	-.44	.08

* Parents were rated in three areas (i.e., attendance, knowledge, and support) by the intervenor who worked with them most closely. Rating scale was 1 = low; 2 = average; and 3 = high.

+ Videotapes of a typical intervention session were scored by independent raters as to how well best practices were followed. Highest possible rating was 32.

^ Parents rated their satisfaction with the program in 7 areas on a scale of 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Table 3.3

Additional Services and Child Health Data for SMA/Lake McHenry Project

Variable	N	One Time Per Week Group Percentage	N	Three Times Per Week Group Percentage
1. Additional Services				
a. Speech Therapy (Average)	29		31	
None		83.9%		79.3%
<1 Hr. Week		6.5%		10.3%
1 Hr. Week		3.2%		6.9%
2 Hrs. Week		6.5%		3.4%
>2 Hrs. Week				
b. Physical or Occupational Therapy	29		31	
None		67.7%		79.3%
<1 Hr. Week		12.9%		6.9%
1 Hr. Week		9.7%		10.3%
2 Hrs. Week		6.5%		
>2 Hrs. Week		3.2%		3.4%
c. % Receiving Social Work Services		0.0%		6.9%
d. % Receiving Home Nursing Services		6.5%		17.2%
e. % Receiving Nutritional Services		3.2%		10.3%
f. % Receiving Respite Services		9.7%		3.4%
g. % Receiving Parent Services		17.2%		22.6%
2. Child Health Over Past Year	23		25	
% With Seizures		9.7%		20.7%
% With Unusual Weight Gain or Loss		9.7%		3.4%
% With Infectious Diseases		3.2%		3.4%
% With Eye/Ear Problems		58.1%		51.7%
General Health				
Worse Than Most		16.1%		24.1%
Average		71.0%		69.0%
Better Than Most		12.9%		6.9%

Table 3.4

Treatment Verification for SMA/Lake-McHenry Project for Year #2 Posttest*

	Basic Intervention Group			Expanded Intervention Group					
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	ES	P Value
Intervenor Rating of Parents									
Attendance	2.5	(.78)	13	2.7	(.72)	15	.20	.26	.66
Knowledge	2.4	(.77)	13	2.9	(.26)	15	6.80	.65	.01
Support	2.6	(.51)	13	2.7	(.62)	15	.06	.20	.81
Parent Rating of Satisfaction	24.1	(2.7)	28	24.9	(2.5)	20	.94	.30	.34
Total Hours of Additional Therapy Services^	119.4	(148.1)	26	157.2	(190.6)	19	.56	.26	.46
Total # of Sessions Attended	15.0	(7.8)	23	37.2	(23.8)	21	18.10	2.87	.00
Total # of Sessions Offered	19.9	(11.1)	23	53.6	(30.8)	21	24.20	3.04	.00
Percent Attendance	78.7	(14.4)	23	68.3	(19.3)	21	4.13	-.72	.05

* Only subjects who were still being served by the programs involved in the study by the end of the 1988-89 school year were rated by intervenors. Attendance data were collected on subjects until they turned 3 and thus were no longer eligible to participate in the program. Attendance data were not available for subjects who left the program after Year One posttest.

^ Based on the total number hours of speech, motor, social work, and respite services received between Year One and Year Two posttests.

the attendance data in Table 3.2. indicates that the experimental group participated in a significantly higher number of intervention sessions than did the control group, thus providing support for the integrity of the experimental comparison. However, percent attendance in the control group was higher (although not statistically significant at p $\leq$ .05) than for the experimental group, which indicates that rather than receiving three times as many services the experimental group received only 2.37 more services than the control group. These findings were similar in Year Two. As the data contained in Table 3.4 indicate, the experimental subjects were offered and attended significantly more treatment sessions during year two than did the control group subjects. The experimental group subjects attended 2.48 times more sessions than did the basic intervention group. However, during Year Two, percent attendance for the control group was significantly higher than for the experimental group. This suggests that even when additional service hours are offered over time, children will attend these sessions less consistently than when less frequent services are offered.

The specialists or educators were also asked to rate each parent's attendance, knowledge, and support for intervention efforts. The ratings for Year One suggest that parent attendance was similar across groups, but that the experimental group was significantly more knowledgeable and supportive of intervention efforts than was the control group. At Year Two, teachers reported parents of children in the expanded intervention group to be more knowledgeable but not more supportive than parents of children in the basic intervention group.

At Year One posttest, videotapes of a typical treatment session were also rated by Dr. Kusmierek to determine the extent to which the intervention represented 'best practices'. The highest possible rating was 32. The results of group comparisons on these variables are contained in Table 3.2. Although there was a trend in the direction of a higher quality of intervention for the control group, the difference between groups on this variable was not statistically significant ($p \leq .05$). There was also no significant difference in the ranking of intervenors by their supervisors, or in the parents' satisfaction with services.

During Year One, the data were analyzed in order to determine the percentage of subjects accessing various levels of additional services. These data indicate that approximately 20% of subjects in each group assessed some form of additional services during the year. The data collected during year two represent the actual number of hours of additional services accessed by subjects in each group. There was not a statistically significant difference between the groups on number of hours of additional services.

Cost of alternative interventions. Costs were estimated using the "ingredients" approach recommended by Levin (1983). This was done by developing a complete description of the alternative intervention programs, identifying all of the "ingredients" used in delivering each intervention, and using information from agency records, observation, or comparable resources to estimate the cost of each "ingredient." Table 3.5 summarizes the average cost per child for 3 days per week versus 1 day per week in the SMA and the Lake McHenry locations. These two programs were used as the basis for the calculations since they serve the majority of the children included in the project.

It is interesting to note that the cost of providing services 2.37 times a week (i.e., $9,035 per child) is only 2.7 times as much as the cost of providing services only one time per week (i.e., $3,404).

Table 3.5
Approximate Costs of Providing Early Intervention Services for SMA/Lake McHenry Project

	One Time Per Week Group			Three Times Per Week Group		
	SMA	Lake McHenry	Average	SMA	Lake McHenry	Average
Personnel						
Direct Service Staff	2,238	1,558	1,898	5,820	3,954	4,888
Secretarial & Administrative	1,277	514	896	3,831	1,542	2,687
Consultants	0	2	1	0	5	2
Facilities	168	216	192	504	648	577
Equipment	42	67	54	126	200	163
Transportation	125	27	76	375	80	227
Materials & Supplies	58	95	76	175	286	230
Utilities, Insurance, & Miscellaneous	12	175	94	37	525	282
TOTAL	**3,920**	**2,654**	**3,287**	**10,868**	**2,240**	**9,056**

Data Collection

All subjects were tested at program entry and then again after one and two years of intervention. Data collection procedures are described below.

Diagnosticians. Two diagnosticians were hired to complete pretesting and year one posttesting. These diagnosticians were not employed by any of the participating programs, and were not informed of the purpose of the study or of the group assignment of the subjects. They were trained to administer the measures by staff of the Early Intervention Research Institute. Scheduling of subjects and monitoring of diagnosticians was coordinated by staff of the SMA program, who also had overall responsibility for coordinating the project for the State of Illinois. Six diagnosticians were used to complete Year Two posttesting. All were graduate students in the School Psychology Program at the University of Wisconsin--Milwaukee (UWM) who successfully met EIRI certification requirements for diagnosticians. Assessment coordination was the responsibility of Dr. McLinden at UWM.

Interobserver agreement was calculated for eight BDI administrations and two Bayley administrations. Mean percent agreement was 92.4% for the BDI, 94% for the Bayley Mental Scale, and 100% for the Bayley Motor Scale.

Pretest data collection. Pretesting was accomplished in two phases. The first phase of pretest data collection occurred at the time that parents consented to participate in the study. At that time, parents completed the Parenting Stress Index, and the educator or specialist assigned to the family's case completed the Wisconsin Behavior Rating Scale. These data were then used for stratification purposes during random assignment.

After the subject had been assigned to a group, the diagnostician contacted the parent and scheduled a testing session to complete the remainder of the pretest battery, consisting of the Battelle Developmental Inventory (BDI), the Family Support Scale (FSS), Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and Family Adaptability and Cohesion Evaluation Scales (FACES III). Testing occurred at one of the program sites closest to the parent's home, although in some instances it was necessary to schedule testing at the home. Parents were paid $20 to participate in the approximately one and one-half hour testing session. Most subjects were tested within two weeks of their assignment to groups.

Year One posttesting. Posttesting was scheduled twelve months after the date upon which the subject first entered services. However, the average amount of time between pre- and posttesting was less than 12 months, due primarily to delays in pretesting some of the children. The time between pre-and posttesting did not, however, differ significantly across groups.

The posttest battery consisted of a large number of child and family measures, which necessitated the scheduling of two separate testing sessions. The first session, which lasted approximately 1-3/4 to 2-1/4 hours and for which parents were paid $20, included the administration of the BDI, PSI, FILE, FRS, FSS, and FACES III. The second session, which lasted approximately 1-1/2 hours and for which parents were paid $15, included the administration of the Bayley Scales of Infant Development, Parent Survey Form, Parent Report of Child's Health, and Parent Satisfaction with Services. A videotape of an interaction session between the child and his/her primary caregiver was also made at this time. Each child's specialist or educator also completed the Wisconsin Behavior Rating Scale at the time of the Year One posttest.

Year two posttesting. Subjects were tested again two years after their initial program entry date. The posttest battery was administered in two sessions in a manner similar to Year One posttesting. Year Two posttesting differed from Year One posttesting as follows: (1) The Scales of Independent Behavior replaced the Bayley Scales and the Wisconsin Behavior Rating Scale as a child outcome measure, (2) Fathers and mothers completed the Comprehensive Evaluation of Family Functioning Scale, and (3) Fathers completed the FSS and FACES III.

Results and Discussion

Pretest Comparisons

Results of comparisons of the Expanded and Basic Services groups on the measures collected at pretest for all subjects as well as those subjects included in Year One and Year Two analyses are presented in Table 3.6. The p values presented in the table are based on one-way analysis of variance. An examination of these values indicates that, at pretest, experimental and control groups were not statistically significantly different on any of the measures of child or family functioning and that attrition did not significantly affect the comparability of groups at either Year One or Year Two.

Posttest Analyses for Year One

Results of the group comparisons on the child outcome measures for Year One are presented in Table 3.7. Analysis of the data for the three measures of child functioning--BDI, Wisconsin, and Bayley Scales--indicated that the groups did not differ significantly after one year of intervention. Indeed, none of the p values even approached significance on any of these measures.

Results of the group comparisons for the family outcome measures for Year One are presented in Table 3.8. Statistically significant group differences were found on the Family Support Scale Total Score and on the FACES III Cohesion score. Mother's FSS total score for adequacy of support was higher (p=.03) for the mothers in the expanded intervention than for those in the control group. This indicates that mothers who participated in services three times per week reported higher levels of helpfulness for available sources of support than did mothers who participated in services once per week. The FACES III Cohesion score for mothers in the expanded intervention group was lower than for the basic intervention group, indicating levels

Table 3.6

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

All Pretested Subjects

Variable	Basic Intervention				Expanded Intervention				
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	P Value
• Age in months at Pretest	15.1	(6.2)		40	13.8	(4.6)		34	.33
• Wisconsin Behavior Age	7.6	(6.9)		40	6.8	(4.4)		35	.68
• Discrepancy Score	.55	(.28)		40	.56	(.27)		35	.97
• Battelle Developmental Inventory (BDI)+ Raw Scores for:									
Personal Social	30.7	(16.4)		40	32.5	(17.5)		35	.63
Adaptive Behavior	25.0	(13.5)		40	23.9	(13.6)		35	.76
Motor	34.3	(26.1)		40	34.8	(24.6)		35	.91
Communication	16.4	(8.0)		40	17.7	(9.2)		35	.53
Cognitive	14.8	(9.0)		40	15.8	(8.6)		35	.60
TOTAL	121.2	(71)		40	124.9	(71)		35	.73
• Parenting Stress Index (PSI) Percentile Rank[@][#]									
Child Related (range 47 to 235)	116.9 (79-196)	(26.9)	88	40	109.1 (61-145)	(20.6)	74	34	.17
Other Related (range 54 to 270)	127.3 (71-187)	(22.6)	61	40	122.9 (61-194)	(30.3)	55	34	.48
TOTAL (range 101 to 505)	244.2 (152-337)	(41.9)	75	40	234.6 (132-320)	(45.9)	70	35	.32
• Family Adaptation and Cohesion Evaluation[°][#] Scales (FACES)									
Adaptation (range)	4.1 (.10-11.9)	(3.6)		39	5.2 (.10-13.9)	(3.3)		34	.20
Cohesion (range)	5.5 (.20-23.8)	(5.6)		39	6.0 (.20-16.8)	(4.1)		34	.71
TOTAL (range)	7.8 (.22-23.8)	(5.5)		39	8.8 (3.58-16.8)	(3.6)		34	.39
• Family Resource Scale (FRS)[%][▲]	117.4	(24.9)	48	38	120.8	(16.0)	54	31	.61
• Family Index of Life Events (FILE)[~][#]	11.5	(7.8)	29	39	12.3	(7.3)	29	34	.63
• Family Support Scale (FSS)[%][▲]	30.2	(12.4)		39	28.8	(10.2)		34	.62

Subjects Included in Year #1 Posttest

Variable	Basic Intervention				Expanded Intervention						
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ES[$]	P Value
• Age in months at Pretest	15.0	(6.1)		31	13.8	(6.3)		29	.57	-.20	.45
• Wisconsin Behavior Age	7.4	(6.9)		31	6.4	(5.8)		29	.32	-.14	.57
• Discrepancy Score	.55	(.28)		31	.55	(.30)		29	.00	.00	.99
• Battelle Developmental Inventory (BDI)+ Raw Scores for:											
Personal Social	30.4	(16.1)		31	31.6	(16.8)		29	.08	.08	.78
Adaptive Behavior	26.0	(13.3)		31	25.2	(13.0)		29	.13	.38	.72
Motor	32.9	(25.0)		31	32.9	(23.1)		29	.00	.16	.99
Communication	16.2	(7.9)		31	17.2	(9.2)		29	.25	1.60	.62
Cognitive	14.5	(9.0)		31	15.6	(8.5)		29	.23	1.22	.63
TOTAL	117.9	(69.2)		31	122.5	(67.7)		29	.07	.07	.80
• Parenting Stress Index (PSI) Percentile Rank[@][#]											
Child Related (range 47 to 235)	119.9 (81-196)	(28.0)	88	31	111.1 (61-145)	(19.9)	76	29	1.94	.31	.17
Other Related (range 54 to 270)	128.4 (71-187)	(24.8)	63	31	134.8 (77-194)	(30.5)	58	29	.25	.15	.62
TOTAL (range 101 to 505)	248.3 (152-337)	(44.0)	78	31	235.9 (145-320)	(43.9)	67	29	1.18	.28	.28
• Family Adaptation and Cohesion Evaluation[°][#] Scales (FACES)											
Adaptation (range)	4.2 (.10-11.9)	(3.8)		30	5.2 (.10-13.9)	(3.5)		29	1.1	-.26	.30
Cohesion (range)	5.6 (.20-23.8)	(5.8)		30	5.8 (.20-16.8)	(3.9)		29	.01	-.03	.90
TOTAL (range)	8.1 (.22-23.8)	(5.4)		30	8.6 (3.58-16.84)	(3.5)		29	.19	-.09	.67
• Family Resource Scale (FRS)[%][▲]	120.1	(25.7)	54	29	118.8	(15.7)	50	27	.13	-.08	.71
• Family Index of Life Events (FILE)[~][#]	10.9	(8.1)	34	30	12.6	(6.0)	34	29	.75	.22	.39
• Family Support Scale (FSS)[%][▲]	30.5	(12.9)	63	30	27.7	(9.4)	50	29	.95	-.21	.34

Subjects Included in Year #2 Posttest

Variable	Basic Intervention				Expanded Intervention						
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ES[$]	P Value
• Age in months at Pretest	15.0	(6.2)		28	12.7	(5.6)		21	1.84	-.37	.18
• Wisconsin Behavior Age	7.4	(7.1)		28	5.2	(4.1)		21	1.54	-.31	.22
• Discrepancy Score	.34	(.3)		28	.32	(.2)		21	.09	-.07	.77
• Battelle Developmental Inventory (BDI)+ Raw Scores for:											
Personal Social	30.4	(16.9)		28	28.1	(12.4)		21	.26	-.14	.62
Adaptive Behavior	23.5	(13.6)		28	23.4	(9.3)		21	.00	-.01	.98
Motor	31.7	(25.9)		28	29.0	(17.0)		21	.17	-.10	.68
Communication	15.9	(8.2)		28	14.8	(6.9)		21	.25	-.13	.62
Cognitive	14.2	(9.3)		28	14.5	(6.4)		21	.02	.03	.89
TOTAL	115.6	(72.1)		28	109.9	(48.1)		21	.10	-.08	.75
• Parenting Stress Index (PSI) Percentile Rank[@][#]											
Child Related (range 47 to 235)	120.9 (81-196)	(29.3)		28	115.0	(16.5)		21	.70	.20	.41
Other Related (range 54 to 270)	125.9 (71-187)	(24.0)		28	120.0	(31.0)		21	.07	-.09	.79
TOTAL (range 101 to 505)	246.8 (152-337)	(45.5)		28	243.0	(41.2)		21	.09	-.06	.76
• Family Adaptation and Cohesion Evaluation[°][#] Scales (FACES)											
Adaptation (range)	3.9 (.10-11.9)	(3.0)		27	5.4 (.10-13.9)	(3.8)		21	1.73	-.39	.19
Cohesion (range)	5.0 (.20-23.8)	(5.7)		27	5.3 (.20-16.8)	(4.0)		21	.04	-.05	.84
TOTAL (range)	7.4 (.22-23.8)	(5.3)		27	8.4 (3.58-16.84)	(3.9)		21	.54	-.19	.46
• Family Resource Scale (FRS)[%][▲]	120.5	(24.7)		28	118.9	(16.9)		21	.20	-.13	.59
• Family Index of Life Events (FILE)[~][#]	10.7	(8.6)		27	13.2	(6.3)		21	1.27	.19	.27
• Family Support Scale (FSS)[%][▲]	29.3	(12.5)		27	26.9	(9.1)		21	.54	-.29	.46

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[°] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental group scored closer to "ideal."

[▲] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[~] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[$] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the $\bar{X}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

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Table 3.7

Year 1 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}^{\#}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
Average Length of Time between Pretest & Posttest		10.7	(1.8)		31	10.4	(2.6)		29	.21	.17	.65
Age in months at Posttest		25.1	(6.3)		31	24.2	(7.3)		29	1.42	.14	.24
Battelle Developmental Inventory Raw Scores for:												
Personal/Social	BRSR	50.5	(26.1)	51.3	31	49.0	(23.0)	48.2	29	.90	-.12	.35
Adaptive Behavior	BABR	36.4	(17.3)	37.0	31	37.4	(14.5)	36.8	29	.02	-.01	.89
Motor	BM	54.7	(31.2)	54.7	31	52.1	(26.6)	52.1	29	.53	-.08	.47
Communication	BCTR	26.6	(13.3)	27.2	31	27.4	(11.8)	26.7	29	.08	.06	.78
Cognitive	BCR	22.6	(12.4)	23.2	31	23.7	(9.6)	23.1	29	.01	-.01	.92
Total	BTR	190.9	(97.9)	193.5	31	189.7	(81.6)	186.8	29	.46	-.07	.50
Bayley Scales												
Mental	BCR	104.3	(51.9)	106.5	31	112.5	(38.3)	110.1	29	.28	.07	.60
Motor	BMR	46.5	(22.6)	46.5)	31	47.2	(17.8)	47.1	29	.06	.03	.81
Wisconsin												
Deviation Score	Pretest	.60	(.37)		31	.68	(.33)		29	1.40	.22	.24
Behavior Age	Pretest	16.8	(10.6)		31	15.7	(9.5)		29	.60	-.10	.44

Table 3.8

Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
o **Parenting Stress Index**												
Child	PSIB	119.2	(20.6)	116.6	31	111.0	(22.8)	113.7	29	.48	.14	.49
Parent	PSIC	128.4	(24.8)	126.6	31	124.8	(30.5)	132.4	29	1.08	-.23	.30
Total	PSIA	247.2	(40.5)	242.3	31	241.9	(52.6)	247.1	29	.37	.12	.55
o **Family Adaptation and Cohesion Evaluation Scales* III (FACES III) - Mother**												
Adaptability	ADAPT	4.4	(2.9)	4.4	30	4.9	(4.1)	4.9	29	.30	-.17	.59
Cohesion	COHES	5.6	(3.9)	5.6	30	3.4	(3.4)	3.4	29	5.8	.56	**.02**
Total	FACET	7.7	(3.8)	7.7	30	6.7	(4.4)	6.7	29	.98	.26	.33
o **Family Resource Scale (FRS)**	FRS	117.8	(24.0)	117.1	29	122.4	(14.6)	123.2	27	2.54	.25	.12
o **Family Support Scale (FSS) - Mother**	FSSAM	27.1	(10.2)	26.3	30	29.8	(10.4)	30.7	29	5.02	.43	**.03**
o **Family Index of Life Events (FILE)**	FILE	10.5	(6.2)	11.0	30	11.1	(6.2)	10.6	29	.13	.07	.72

of family cohesion closer to the ideal for this variable. There were no statistically significant differences on any of the other family measures.

The results of the Marfo frequency analysis of the parent-child interaction videotapes are included in Table 3.9. Out of 35 variables tested, a statistically significant difference was found for only one--*Child Complies with Mother's Verbal Instruction*. This is no more than would be expected to be found by chance when so many variables are being tested. Thus, it does not appear that there are any meaningful differences between the two groups in terms of parent-child interaction as rated by the Marfo Frequency analysis.

Subgroup Analyses for Year One

To examine the relative effectiveness of once per week versus three times per week services with a more homogeneous subsample of children with overall delays, children whose primary handicapping condition was either a speech/language or motor delay (i.e., children whose cognitive functioning was not impaired) were excluded from the analysis of the posttest data. The results of this subgroup analysis are presented in Table 3.10. An examination of these data indicates that even with a more homogenous sample, there were no statistically significant differences between the groups on any measures of child or family functioning.

Posttest Analyses for Year Two

For one subject in the expanded services group, the family declined to have the child complete the measures of child functioning, but did complete the family measures. The results of the analyses of the child functioning measures for Year Two for all other subjects are contained in Table 3.11. As was true for Year One, there were no statistically significant differences between the groups on any of these measures.

Table 3.9

Year 1 Posttest Analyses for Videotapes of Parent/Child Interaction

Analysis for SMA/Lake-McHenry

	Basic Intervention Group			Expanded Intervention Group				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	Prob.
• Parent verbal mand	4.1	(4.6)	26	3.9	(1.2)	25	.03	.87
• Parent nonverbal mand	.2	(.3)	26	.2	(.2)	25	.31	.58
• Parent verbal response	1.0	(.6)	26	1.1	(.4)	25	.49	.49
• Parent nonverbal response	.2	(.3)	26	.2	(.2)	25	.21	.64
• Parent verbal response mand	.2	(.3)	26	.2	(.1)	25	.16	.69
• Parent nonverbal response mand	.0	(.0)	26	.0	(.0)	25	2.19	.14
• Parent verbal unlinked	1.9	(1.1)	26	1.7	(.6)	25	.21	.65
• Parent nonverbal unlinked	1.3	(.7)	26	1.3	(.4)	25	.34	.56
• Child verbal mand	.1	(.3)	26	.1	(.2)	25	.12	.73
• Child nonverbal mand	.1	(.2)	26	.2	(.2)	25	1.19	.30
• Child verbal response	1.3	(3.9)	26	.5	(.8)	25	1.03	.31
• Child nonverbal response	1.8	(.9)	26	1.9	(.6)	25	.16	.69
• Child verbal response mand	.0	(.0)	26	.0	(.0)	25	.96	.33
• Child nonverbal response mand	.0	(.0)	26	.0	(.0)	25	–	–
• Child verbal unlinked	.8	(1.1)	26	.6	(.3)	25	.73	.40
• Child nonverbal unlinked	1.4	(.7)	26	1.5	(.5)	25	.21	.65
• Parent initiates topic	.9	(.5)	26	.9	(.2)	25	.01	.91
• Parent follows topic	.3	(.4)	26	.4	(.2)	25	.18	.67
• Child follows topic	.7	(.5)	26	.7	(.2)	25	.00	.94
• Child initiates topic	.4	(.4)	26	.5	(.2)	25	1.27	.26
• Parent verbal inhibition	.1	(.1)	26	.1	(.1)	25	1.69	.20
• Parent nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	.89	.35
• Parent intrusion (inadvertent)	.1	(.1)	26	.1	(.1)	25	1.41	.24
• Child complies with verbal inhibition	.0	(.1)	26	.1	(.1)	25	4.51	.04*
• Child complies with nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	3.04	.09
• Parent standard imperative	1.8	(.8)	26	2.2	(.7)	25	3.56	.06
• Parent embedded/implied directive	.6	(.7)	26	.7	(.4)	25	.11	.74
• Child complies with standard imperative	.9	(.4)	26	1.0	(.4)	25	1.25	.27
• Child complies with embedded/ implied directive	.4	(.7)	26	.2	(.2)	25	.85	.36
• Parent labels	.4	(.2)	26	.4	(.2)	25	.06	.80
• Parent expands	.1	(.1)	26	.0	(.1)	25	.66	.42
• Parent gives information	.6	(.5)	26	.6	(.3)	25	.00	.97
• Parent requests information	1.5	(.4)	26	1.2	(.7)	25	.29	.59
• Parent models	.7	(.3)	26	.8	(.5)	25	1.23	.27
• Parent reinforces	.4	(.3)	26	.3	(.3)	25	.07	.79

Table 3.10

Year #1 Posttest for SMA/Lake-McHenry Project

(Excluding Subjects with Speech/Language and Motor Impairments)

Variable	Covariates	Basic Intervention Group				Expanded Intervention Group				ANCOVA F	ES[$]	P Value
		$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n			
Chronological Age at Posttest	–	24.1	(6.1)		27	23.7	(6.8)		24	.24	-.07	.63
No. of Months Between Pre- and Posttest	–	10.6	(1.9)		27	11.0	(1.9)		24	.60	.21	.44
Battelle Developmental Inventory (BDI) Raw Scores *	BDI Pretest raw scores	Adj. $\bar{X}$										
Personal-Social	P/S	50.0	(23.0)		27	46.0	(16.3)		24	.25	-.17	.62
Adaptive Behavior	Adaptive	50.0	(16.0)		27	55.0	(11.4)		24	.07	.31	.80
Motor	Motor	46.0	(30.1)		27	42.0	(23.6)		24	.19	-.13	.66
Communication	Comm.	50.0	(11.2)		27	51.0	(7.8)		24	.29	.09	.59
Cognitive	Cognitive	50.0	(11.1)		27	55.0	(6.7)		24	.16	.05	.69
Total	Total	54.0	(88.7)		27	51.0	(61.0)		24	.01	-.03	.91
Bayley Scales Raw Scores	None											
Mental Scale		96.2	(50.7)		27	104.4	(36.4)		24	.44	.16	.51
Motor Scale		42.9	(21.8)		27	42.8	(15.7)		24	.00	-.00	.98
Parenting Stress Index*	PSI Pretest											
Total Score	Total	248.3	(41.0)	78	27	256.4	(50.8)	84	24	.94	-.20	.34
Child Domain	Child	120.5	(20.3)	89	27	117.5	(20.6)	87	24	.44	.15	.51
Parent Domain	Parent	128.7	(27.8)	65	27	137.7	(35.9)	76	24	2.35	-.32	.13
Family Support Scale*	FSS Pretest											
Total Score - Mother		26.2	(10.4)	45	27	29.5	(10.6)	57	24	2.45	.32	.12
Family Resource Scale*	FRS Pretest											
Total Score		116.0	(25.0)	46	27	121.2	(16.0)	55	24	1.37	.21	.25
General Resources		77.5	(15.1)		27	79.4	(11.0)		24	.71	.13	.41
Time Availability		37.4	(11.8)		27	39.5	(9.7)		24	.61	.18	.44
Physical Resources		31.1	(5.6)		27	31.8	(3.4)		24	.79	.13	.38
External Support		23.2	(6.3)		27	23.9	(3.8)		24	.26	.11	.62
FACES III*	FACES											
Discrepancy Score	Disc Pretest	9.8	(8.9)		26	11.8	(8.6)		24	.84	-.22	.37
FILE*	FILE Pretest	11.8	(6.5)	29	27	11.7	(6.3)	29	24	.00	.02	.94
Wisconsin	Wisc Pretest											
Deviation Score+		.52	(.34)		27	.61	(.31)		24	1.36	.26	.25
Behavior Age**		13.3	(9.3)		27	14.3	(7.1)		24	.35	.11	.56

[$] On those variables in which higher scores indicated more favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Control Group from the mean of the Experimental Group and dividing by the mean of the Control Group. On those variables in which higher scores indicated less favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Experimental Group from the mean of the Control Group and dividing by the mean of the Control Group.

[+] Wisconsin Deviation Score was computed by dividing the child's behavior age by the child's chronological age.

[**] Wisconsin behavior age reflects the child's age equivalent score.

[*] See table 3.2 for additional footnotes.

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Table 3.11

Year 2 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

Variable	Covariates	Basic Intervention Group (0)				Expanded Intervention				ANCOVA F	ES	P Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
Average length of time between Posttests 1 and 2	---	12.9	(1.5)		28	12.7	(1.9)		21	.08	.13	.78
Age in months at Posttest 2	---	38.9	(6.5)		28	36.1	(6.7)		21	1.62	.43	.21
• **Battelle Developmental Inventory (BDI) raw scores for:**												
Personal/Social	BPSR	78.0	(40.7)	75.9	28	74.4	(31.1)	77.4	20	.06	.04	.80
Adaptive Behavior	BABA	48,0	(25.2)	47.8	28	48.7	(18.4)	48.9	20	.09	.04	.76
Motor	BMR	62.1	(38.2)	60.7	28	63.0	(26.4)	65.0	20	.48	.11	.49
Communication	BCTR	35.4	(23.2)	33.8	28	30.5	(16.8)	32.7	20	.10	-.05	.76
Cognitive	BCR	28.5	(18.9)	28.6	28	24.8	(12.5)	24.7	20	1.95	-.21	.17
Total	BTR	252.0	(140.5)	246.8	28	241.4	(97.1)	248.6	20	.01	.01	.92
• **Scales of Independent Behavior:**												
Early Development Raw	BABR	62.6	(31.6)	62.4	28	62.2	(24.5)	62.5	20	.00	.00	.99
Short Form Raw	BABR	23.0	(15.7)	22.9	28	23.5	(10.8)	23.6	20	.07	.04	.79
Early Development Standard Score	BABR	56.2	(36.7)	56.0	28	53.6	(32.4)	53.8	20	.06	-.06	.81
Short Form Standard Score	BABR	67.8	(29.8)	67.6	28	69.8	(26.3)	70.0	20	.13	.08	.72
General Health	GENHLTH1	1.9	(.47)	1.9	28	1.8	(.48)	1.9	21	.16	.00	.70

The results of the analyses of the Year Two posttest measures of family functioning are contained in Table 3.12. There was a statistically significant difference between the groups for Mother's Family Support Scale Score for adequacy of support. This is consistent with the findings for Year One. However, there was no statistically significant difference between the groups on the FACES III Cohesion score, as had been found in Year One. However, the Expanded Intervention group continued to have a more positive score on this variable than did the Basic Intervention group.

Table 3.12

Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index**												
Child	PSIB	121.6	(23.8)	120.0	28	114.3	(26.3)	116.4	21	.39	.15	.54
Parent	PSIC	132.1	(26.8)	133.0	28	135.1	(40.2)	134.0	21	.03	.04	.87
Total	PSIA	253.7	(45.9)	252.1	28	249.4	(62.0)	251.5	21	.00	.01	.95
• **Family Adaptation and Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	ADAPT	4.8	(3.3)	4.9	27	6.4	(4.2)	6.3	21	1.50	-.42	.23
Cohesion	COHES	5.4	(3.9)	5.5	27	3.9	(5.3)	3.8	21	2.27	.44	.14
Total	FACET	7.8	(4.3)	8.0	27	8.6	(5.2)	8.3	21	.08	.07	.78
• **Family Adaptation and Cohesion Evaluation Scales III (FACES III) - Father**												
Adaptability	EDUCF	3.8	(3.1)	3.9	18	4.2	(2.2)	4.1	15	.05	-.06	.82
Cohesion	EDUCF	4.1	(4.0)	4.2	18	5.0	(5.1)	4.8	15	.18	-.15	.68
Total	EDUCF	6.2	(4.2)	6.4	18	7.1	(4.7)	7.0	15	.19	-.14	.67
• **Family Resource Scale (FRS)**	FRS	118.3	(17.7)	117.7	26	120.1	(19.2)	120.8	21	.38	.18	.54
• **Family Support Scale (FSS) - Mother**	FSSAM	25.5	(9.0)	24.9	27	29.4	(10.7)	30.1	21	5.59	.58	.02
• **Family Support Scale (FSS) - Father**	FSSAMF	28.4	(7.7)	28.0	19	28.6	(9.1)	29.0	17	.16	.13	.69
• **Family Index of Life Events (FILE)**	FILEA	9.8	(7.3)	10.4	27	10.8	(5.9)	10.0	20	.08	.05	.78
• **CEFF - Mother**												
Total Frequency	EDUCM	93.7	(27.9)	93.6	27	95.3	(19.8)	95.3	19	.05	-.06	.83
Total Problems	EDUCM	7.3	(7.9)	7.1	26	8.1	(9.6)	8.3	19	.22	-.15	.64
• **CEFF - Father**												
Total Frequency	EDUCF	91.4	(25.7)	91.4	18	95.6	(17.3)	95.6	14	.27	-.17	.61
Total Problems	EDUCF	6.3	(6.8)	6.4	18	5.3	(7.9)	5.2	13	.18	.18	.68

Discussion

A few conclusions can be made about the relative effectiveness of once per week versus three times per week services given the longitudinal data presented for this population. First of all, it does not appear that increasing the number of service hours to three times a week has a significant effect on the handicapped child's skill development. Although there were three separate indices of the child's developmental level at Year One and two indices at Year Two, there were no significant differences between the once per week and three times per week groups on any of these measures.

Although the interventions did not appear to differentially affect child skill development, there were indications that the three time per week intervention had positive effects on perceived levels of support by mothers. The higher score for mothers' reported satisfaction with sources of support at both Year One and Two lends credence to the assumption that three times per week services allow for an increase in the amount of family support which programs can provide.

Although the results of this study do not provide support for increasing service hours for purposes of improving child functioning, the observed effects of the increased level of services on mother's perceptions of support must be considered. Based on the consistent effects of family functioning, but lack of effects on child functioning after two years of intervention, it might appear that the significant increase in the cost of providing three times per week services versus once per week services may not be warranted. However, one hypothesis which might be presented is that the observed effects on parental support and resources might generalize to more profound outcomes such as a maintenance of parental marital status and willingness of the family to continue to maintain the child in the home. The longitudinal data to be collected in future years will be crucial in addressing these issues.

Future Plans

During the 1989-90 school year, all subjects will have graduated from the early intervention programs in which they participated in this study. These subjects will be posttested approximately one year following their Year Two posttest.

The Year Three posttest battery will consist of the EIRI core measures (BDI, FRS, FSS, FACES III, FILE, and Demographic and Treatment Verification Measures), as well as the following complementary measures: (1) Questionnaire to be completed by the child's current teacher regarding current special education placement and progress, (2) The Comprehensive Evaluation of Family Functioning Scale completed by both mother and father, (3) Completion of FACES III by fathers, and (4) Child Behavior Checklist for 2- to 3-year-old children (Achenbach, 1986).

Two procedures will be implemented in order to insure that the subjects tested during Year Two will continue to participate in the study. First, birthday cards will be sent to all subjects as a way of maintaining one additional contact with the subjects throughout the year. Second, a letter will be sent to all subjects one month before their scheduled testing date in order to remind them of the upcoming testing session and to request that they contact us should they have any specific scheduling needs. To date, 11 subjects have participated in Year Three posttesting. In addition, one subject for whom no child outcome data were available at Year Two has agreed to participate in the full Year Three posttest battery.

ARKANSAS INTENSITY STUDY

Project #4

COMPARISON: Mildly to Severely Handicapped Children--Home-based intervention once per week versus home-based intervention twice per week.

LOCAL CONTACT PERSONS: Lowell Collins, Coordinator (Sunshine Preschool); Janice Hardin, Ed.D., Coordinator (Richardson Center)

EIRI COORDINATOR: Chuck Lowitzer, Ph.D.

LOCATION: Bentonville, Arkansas, and Fayetteville, Arkansas

DATE OF REPORT: 10-9-89

Rationale for the Study

Limited evidence in the existing literature is available to guide programming decisions concerning the relative effectiveness of various intensities of early intervention (White & Casto, 1985). The frequency and intensity with which early intervention services are provided varies across program models based largely on philosophical orientation and professional judgement of individual child needs. There is little empirical data upon which to make determinations as to the optimal frequency with which home based services should be provided. This study was designed to respond to the need identified by service providers for guidelines to use in determining the most appropriate service intensity to provide when using a home-based model. The study provides a comparison of the effectiveness of two levels of intensity of home-based services for children from birth to five years old.

Review of Related Research

Currently, parents and professionals often make decisions regarding the form services should take based only on their experience and/or philosophy of the human condition (Fredericks, 1985). Rarely are the program models, approaches, or curricular contents evaluated in a systematic manner (Switsky & Haywood, 1985). The field lacks empirical findings in many areas critical to the training and education of severely handicapped young children. The treatment intensity issue is of particular importance in programs serving moderately and severely handicapped young children because the developmental needs of these children would suggest that they need more intervention and because of concern for the costs associated with increased intervention. Although research in this area is sparse (Bailey & Bricker, 1984), Casto and his colleagues have reported a series of meta-analyses that indicate that intensity of intervention may be an important variable with handicapped children (Casto, in press, 1987; Casto & Mastropieri, 1986). Specifically, Casto (1987) noted that intensity and duration appeared to be important considerations for programs serving handicapped preschoolers, but less so for disadvantaged populations. When adjustments were made for age at start of intervention, quality of outcome measures, and time of measurement, the range of effect sizes was .45 to .88, in favor of more intense interventions (Casto, 1987). These effect sizes indicate that more intense or longer intervention resulted in a performance difference of between about one-half to more than three quarters of a standard deviation on whatever measure of child progress was used. These encouraging findings, however, must be viewed with caution because many studies included in the analysis were confounded by the investigators' failure to distinguish intensity and duration of intervention and/or their failure to include other important variables in the analyses. Continuing literature searches by White and his colleagues (White, 1986; White & Casto, 1985) have found few studies that have systematically compared intervention programs that varied solely on the intensity of intervention, particularly in home based intervention models.

One of these studies, however, is particularly important in light of the commonly held belief that "more is better" when it comes to early intervention. A well designed research project by Sandow, Clarke, Cox, and Stewart (1981) compared a home visit program conducted twice per month versus once every two months. The two service groups of 16 children (total of 32 children) were contrasted with each other and with a matched comparison group of 15 children who received no intervention. The children had a mean chronological age of two years six months and a mean mental age of one year three months at the start of the study. Differences in cognitive functioning were not statistically significant after one year, and after two years differences favored the lower intensity group. After three years there were again no statistically significant differences between groups, although the no service comparison group had only 2 children who had gained in IQ as compared to 6 in the more intense group and 5 in the less intense group. Sandow et al. concluded from their findings that less intervention may be more beneficial in that parents then tend to rely more on their own capabilities than on those of the interventionist(s). The authors also suggested that perhaps "a high level of intensity should gradually decrease as the parents become more capable of taking charge" (p. 140).

The research reported here represents an effort to fill a gap in the literature with respect to the optimal intensity of home-based services. This research will enrich the existing data base and will ultimately yield information helpful in determining the optimal frequency of home visits for young children with handicaps. The study will also contribute by including an analysis of the cost differences between the two levels of intensity, an area in which Barnett and his colleagues (Barnett, 1986; Barnett & Escobar, 1987) have noted the sparsity of data.

The effects of varying the intensity of service are investigated within the framework of Family Systems Theory (Haley, 1976, 1980). We are assessing the long term impact of two intensity levels (once per week versus twice per week home visits) on both child and family outcomes. Family systems theory, an extension of the interaction process approach, provides a conceptual framework from which to study the impact of early intervention on the families of handicapped children. A variety of factors that influence the developing child are included in this framework, and several factors considered most important are being evaluated in the present investigation. Specifically, family demographics, sources of support available to the family and child, family interaction style, and parental stress are being measured. Attention is being paid to differential effects of intervention intensity on children with varying levels of severity of handicap. Parent involvement is also being assessed because some data suggest that interventions requiring substantial parent time may actually increase stress and disrupt family functioning and because home-based delivery systems often require significant amounts of parent time (Turnbull, Summers, & Brotherson, 1983). Finally, teaching quality and adherence to the research protocol are being monitored.

Overview of Study

Children and families participating in this study were randomly assigned to either once per week or twice per week home-based intervention. Additional services such as occupational, physical, and speech therapy were also available to children in both groups and were provided on approximately a 2:1 basis. All children and parents have completed a battery of tests that address the child's developmental status, family demographics, and parental stress, sources of support, and family type (along the dimensions of adaptability and cohesion). Enrollment was conducted during two academic years (1986-87 and 1987-88), such that two cohorts of subjects are enrolled. The first cohort completed its third posttest in 1989, while the second cohort completed its second (see Table 4.1).

Table 4.1

Number of Children Tested by Test Date, Group, Cohort, and Site

	Pretest Year		Posttest Session		
	1986-1987	1987-1988	Spring 1987	Spring 1988	Spring 1989
COHORT #1					
Standard Service					
Sunshine	21	–	20	16	14
Richardson	5	–	5	4	4
Expanded Service					
Sunshine	25	–	24	19	17
Richardson	7	–	7	5	6
Total Sunshine	46				
Total Richardson	12				
Cohort # 1	58				
COHORT #2					
Standard Service					
Sunshine	–	2	–	1	2
Richardson	–	4	–	3	3
Expanded Service					
Sunshine	–	9	–	8	6
Richardson	–	4	–	3	3
Total Sunshine		11			
Total Richardson		8			
Cohort # 2		19			
Total Sunshine	58				
Total Richardson	19				
Total	77				

Methods

Program Organization

The Sunshine Preschool and Richardson Center are funded under the Arkansas Developmental Disabilities Council to serve handicapped individuals not being served by the public schools due to either age or severity of handicap. The two programs are administered by on site coordinators who manage the research. The Sunshine program serves children from birth to school-age, and the Richardson Center serves persons from birth to adulthood; at the preschool level, both centers have home-based programs for children birth to three and center-based programs for children three to five. The Sunshine program also provided home-based services to children three to five when transportation to the center could not be arranged.

Prior to the initiation of the research, the Richardson Center program was entirely center-based, serving children on a schedule that was agreed upon by parents and center staff. Because of serious attendance problems, staff were not satisfied that the center-based delivery system was the most effective system available for serving young handicapped children. They looked to the Sunshine Center as a model for home-based delivery. When the director of the Richardson Center decided to adopt a home-based model, she was invited to participate in the research. The staff at Richardson were then trained and evaluated by the Sunshine preschool coordinator. Richardson has a staff of approximately 30 professional and paraprofessionals. There are two home-teachers, a speech therapist, and a physical therapist involved in serving the children in the study.

The Sunshine school has two separate facilities that house classrooms, offices, and a vocational program. Sunshine has a larger preschool staff and serves more very young clients. Both Sunshine and Richardson Centers have a well-developed philosophy. Their main service goal for preschoolers is to develop functional, generalizable skills that enhance development. Both centers transition some children into public school special education programs and continue to provide school-age services to the most severely disabled. The transition process is explained in the treatment verification section.

With the help of staff at EIRI, funds were identified and obtained to enable the directors of both the Sunshine preschool and the Richardson Center to offer twice per week home-based services on a short term basis (two years) for a limited number of children. Without these funds, the standard level of once per week or once every other week would have been provided to all children.

Subjects

Subjects for this study were children from birth to four years of age (at time of enrollment) who were determined eligible for early intervention services according to Arkansas Developmental Disabilities Division standards. As explained below, children in the programs involved with this project qualified for participation on the basis of their age and type and severity of handicapping condition. For each child who met the study criteria, parents signed an informed consent indicating that they were willing to participate in either the standard intensity (one visit per week) or the expanded intensity (two visits per week) conditions based upon a random assignment. Children were not enrolled in the study if over 48 months of age at the time of pretesting. This ensured that all participants received a minimum one year of treatment before graduation to public school programs. The children were initially screened using the Developmental Profile II (Alpern, Boll, & Shearer, 1980). If they were functioning significantly below age level, further individualized assessments were administered. A child who could complete 75% of items at his/her age range was excluded from further evaluation. Three age levels (0 to 20 months; 21 to 36 months; and 36 to 48 months) and three levels of handicap (severe [< 25% of age level]; moderate [25 to 50% of age level]; and mild [51 to 75% of age level on the Alpern-Boll]) were included for stratification purposes.

Recruitment. All families with children receiving services prior to the 1986-87 academic year, and all new referrals during that year and the Fall of the 1987-88 year were approached by personnel from the Benton County Sunshine Preschool or the Richardson Center for possible participation in the study. Of those approached, all but 5 (2 at the Sunshine program and 3 at the Richardson Center) agreed to participate. This represents a 94% (77 of 82) rate of participation.

Assignment to groups. A total of 77 3 to 48 month-old children with mild to severe developmental delays were randomly assigned to the two treatment conditions after stratification by chronological age and developmental functioning level (as described above). A complete description of assignment procedures is provided in the 1987 Annual Report of the Early Intervention Effectiveness Institute.

Seventy-one children were posttested one year after pretest. Fifty-eight children have been tested after two years and 41 children have been tested after three years (see Table 4.1). Four subjects who have moved are being scheduled for third posttesting (two of whom were missed last year), and efforts are being made to reschedule children who missed previous appointments (9 children from the Sunshine program and 2 from the Richardson Center). One severely handicapped subject died between first posttest and second posttest. Two other children were in foster homes, and the instability of their placements necessitated discontinuance of their participation in the study (one before first posttest and one shortly after). Six parents withdrew due to dissatisfaction with their participation in the research (the demands of the testing were felt to be too intrusive for the parents and/or children). Efforts are being made to contact other families that have moved and/or dropped out of the study for other reasons to either get them involved in further posttesting or to identify their reasons for discontinuing participation.

Demographic characteristics. Pretest demographic data for subjects participating in each posttest to date are presented in Table 4.2. Families served

Table 4.2

Comparability of Groups on Demographic Characteristics for Sunshine/Richardson Treatment Intensity Study at First, Second, and Third Posttest

	Children Participating at Posttest #1							Children Participating at Posttest #2							Children Participating at Posttest #3						
	Standard Intensity			Expanded Intensity				Standard Intensity			Expanded Intensity				Standard Intensity			Expanded Intensity			
	x̄	SD	n	x̄	SD	n	p Value	x̄	SD	n	x̄	SD	n	p Value	x̄	SD	n	x̄	SD	n	p Value
● Age of mother in years	31.4	8.8	29	31.4	7.3	40	.99	30.8	7.2	26	30.8	7.2	31	.97	32.6	7.2	18	30.7	6.8	23	.40
● Age of father in years	33.4	33.7	29	33.7	8.1	39	.90	32.9	7.8	27	32.9	8.3	30	.96	33.3	7.1	18	31.9	6.8	22	.52
● Percent Male*	65%		31	63%		40	.86	63%		27	60%		31	.93	72%		18	62%		23	.20
● Years of Education--Mother	11.5	2.1	30	12.3	2.2	40	.11	11.7	2.1	27	11.9	1.9	31	.61	11.0	1.8	18	12.0	2.0	23	.11
● Years of Education--Father	11.7	1.5	29	12.2	2.4	39	.28	11.9	1.4	27	12.1	2.3	30	.66	11.2	1.2	18	11.5	1.8	22	.46
● Percent with both parents living at home	81		31	85		40	.83	85		27	83		31	.89	89		18	87		23	.86
● Percent of children who are Caucasian*	94		31	95		40	.80	93		27	90		31	.76	100		18	96		23	.38
● Hours per week mother employed	8.4	15.5	30	19.7	21.0	40	.02	10.9	17.0	27	19.0	19.3	31	.10	7.8	16.0	18	18.0	18.9	23	.07
● Hours per week father employed	34.0	20.7	29	41.2	17.9	39	.13	36.6	19.2	27	37.3	17.3	30	.88	38.4	19.6	18	37.2	20.8	22	.86
● Percent of mothers employed as technical/managerial or above	0		30	13		40	.06	0		27	9.7		31	.10	0		18	17		23	.07
● Percent of fathers employed as technical/managerial or above	7		29	21		39	.12	7.4		27	10.0		30	.74	0		18	13		22	.11
● Total household income^	$15,500	$ 9,243	30	$17,862	$10,615	40	.33	$15,907	$ 9,857	27	$16,355	$10,162	31	.86	$14,862	$ 7,737	18	$16,770	$9,781	23	.51
● Percent receiving public assistance	53		30	53		40	.95	48		27	55		31	.52	56		18	48		23	.63
● Percent with mother as primary caregiver	84		31	83		30	.88	85		27	81		31	.66	83		18	83		23	.95
● Percent of children not in daycare*	61		31	63		40	.10	78		27	58		31	.11	83		18	70		23	.32
● Number of siblings	1.5	1.5	30	1.3	1.2	40	.39	1.4	1.3	31	1.1	1.2	31	.30	0.8	1.6	18	0.1	0.2	23	.02
● Percent with English as primary language	100		30	100		40	.99	100		31	100		31	.99	100		18	100		23	.99

NOTES:

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scores "1," and those not possessing the trait were scored at "0."

^ Means and standard deviations for this variable were estimated from categorical data.

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lived in predominantly rural areas. The ethnic background of the subjects was predominantly Caucasian. Family incomes ranged from less than $5,000 to $39,999, with 30% falling into the low SES category (below $15,000). The average number of years of education for parents was between 11 and 12 years for both groups.

Intervention programs. The expanded intervention was an extension of the standard service that was delivered prior to the initiation of the research. It consisted of two home sessions per week and was compared to the standard intensity of one time per week. The service ratio between groups over two years of expanded service availability was approximately 2:1, with the expanded intensity group receiving an average of 1.4 home visits per week versus standard intensity receiving an average of 0.7 visits.

Standard intervention group. The standard intervention group received an average of 0.7 intervention visits per week from trained paraprofessionals. The preschool supervisor was responsible for training. The home teachers spend two weeks in individualized training, and are then closely supervised on their first home visits. Nine home teachers participated, of whom two have baccalaureate degrees, and all have extensive experience and background in early intervention.

Motor and speech/language therapists provided individual therapy to children whose evaluation data indicated a therapy need on a weekly basis. The children were brought to the center for their therapies that lasted approximately 1/2 hour. The home-based intervention took place primarily in the subject's home, although a small number of children were visited in daycare centers or at baby sitters. The home teachers focused on working with the children directly. The parents were expected to observe and demonstrate to the home visitor what they have learned. Home visits lasted approximately one hour.

An Individual Education Plan (IEP) was developed for each child and was used to guide the educator in working with the child and parent(s) during the sessions.

The content of the home visits was taken from the IEP, which was based on recommendations made by the multidisciplinary assessment team, which typically included a psychologist, speech/language pathologist, OT/PT, educator, and the child's parent. Goals and objectives for the child were agreed upon by the educator and the parent, considering the parents' needs and the child's progress over time. A variety of assessment instruments and curricula were used to develop the objectives in the IEP.

Intervention programs focusing on the development of functional skills were provided by the home teachers and were individualized based on the child's developmental level and the family's functioning. Typical goals included self-help (particularly feeding), gross motor, and communication skills. The primary care taker was required to demonstrate skill in positioning, feeding, and in 15 cases, medical technology such as oxygen, respirators, gavage feeding, and catheters. The home teachers were highly specialized in these areas and helped parents meet the medical as well as developmental needs of their children. Less severely handicapped children received programs focusing on their language, cognitive, self-help, and gross and fine motor needs.

Home teachers were assigned to children based on the children's level of functioning such that each teacher served approximately equal numbers of children in both groups. Three of the nine teachers had extensive experience with the severely handicapped. The other teachers had early childhood backgrounds as indicated in Table 4.3, which also indicates the number of children served by group. Each teacher was observed at least two times annually by the EIRI staff coordinator and has consistently demonstrated knowledge, creativity, and sensitivity in dealing with young children who are handicapped and their families.

Table 4.3

Teacher Qualification and Original Assignments

Teacher	Education	Experience	# of Children in Standard	# of Children in Expanded
1	14 years	1 year	5	4
2	12 years	6 years	5	5
3	12 years	1 year	0	2
4	B.A.	2 years	6	6
5	M.A.	3 years	4	7
6	12 years	10 years	5	6
7	12+ years	1 year	4	6
8	12+ years	1 year	5	5
9	B.A.	2 years	0	2
TOTAL			*34*	*43*

The home visit included the following activities: warm-up play period, discussion of current concerns and child's status, direct 1:1 programming designed to meet specific objectives, work with the parents, discussion of progress made towards objectives, and data recording. When ending the visit, the teacher reminded the parent of the next visit and of any scheduled therapies; left data sheets, program descriptions, detailed instructions, and materials for the parent to use; and gave the parent encouragement and praise. Program data and anecdotal notes were recorded for each home visit.

The curriculum was based on comprehensive assessments as was a modification of the Learning Accomplishment Profile. The home teacher brought a variety of materials and toys for programs and the child's folder for recording data. She worked individually with the child, keeping data on 4 to 6 goal areas. Every attempt was made to involve the parents in the activities. For example, the home teacher demonstrated how to position a child for feeding and provided direct modeling, shaping, prompting, and positive reinforcement to the parent. Once the teacher had instructed the parent on how to carry out the activity, a schedule was set up for the parent to follow. The amount of time a parent was expected to spend with the child depended on the child's needs and the parent's willingness and ability.

The teachers created data recording sheets for parents that included the following: (1) a specification of the activities to be conducted; (2) spaces to record data and duration of activity; and (3) spaces to record correct responses and errors, as well as progress made towards the objective. In some cases, the only data recorded by parents was whether or not the activity took place or how the activity went. For example, in a feeding program, the key data recorded would be that the child consumed two ounces orally.

The teachers kept more detailed data on number of trials, correct and error rates, and a specified description of what progress took place towards each objective worked on. The teachers' anecdotal records tended to describe the session, the parents and child response, and plans for the next session.

The IEPs were evaluated by the multidisciplinary team on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary and shared with the multidisciplinary team. (During the site visit described below, 10% of the IEPs were randomly sampled for evaluation and were found to be age appropriate, developmental, and functional in nature.)

Expanded intensity group. The expanded intensity group received exactly the same type of service delivery as the low intensity group, but with an average of 1.4 times per week for home visits.

Treatment verification. A number of procedures were implemented in order to verify that the interventions for the two different experimental groups were being implemented as intended.

The EIRI coordinator communicated on at least a weekly basis with the on site coordinator, assisted in areas of program development and child find efforts, and made periodic site visits. The site was visited three times during the 1987-1988 year by the EIRI site coordinator. Other program verification activities included:

1. ***Collection of attendance data.*** The child's participation in the program for both groups was recorded according to the length of the session and the staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance. Table 4.4 contains attendance data by group for the two years during which expanded services were available (1987-87 and 1987-88). The table indicates that treatment was delivered slightly above the intended 2:1 frequency difference, and that rates of attendance for home visits were nearly equal.

Table 4.4

Total Attendance Data for 1986-87 and 1987-88

	Standard Intensity			*Expanded Intensity*				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES	p Value
# of home visits	19.2	7.6	29	43.0	17.3	42	1.76	.00
% Schedule visits completed	85		29	84		42		.87

2. ***Data describing the quality of parent involvement has been collected.*** Home teachers rated parents in three areas: attendance (in IEPs, meetings, therapy, home visits), knowledge regarding their child and rights, and support activities (follow through, communication with staff, form completion, etc.). Parents were rated on each area with a 3-point scale, 1 = low, 2 = average, 3 = high. Table 4.5 contains the results of this teacher rating of parent involvement. Although none of the between group differences are statistically significant, the large effect sizes suggest that teachers rated parents in the expanded group as more involved than those in the standard group.

Table 4.5

Teacher Ratings of Parent Involvement

	Standard Intensity			*Expanded Intensity*				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES	p Value
Attendance	2.1	.82	29	2.3	.68	42	.28	.25
Knowledge	1.9	.88	29	2.2	.75	42	.35	.15
Support	1.8	.83	29	2.2	.82	42	.50	.05

3. ***Teacher evaluations.*** The preschool supervisor evaluated teachers using two scales developed by EIRI staff. One was a 3-point scale (3 = criteria fully met; 2 = partially met; 1 = not met) that addressed the following areas: teacher assessment skills, IEP development skills, IEP implementation skills, presentation of instruction, and instructional environment. The second assessed the following teacher traits on a 5-point scale (5 = outstanding, 4 = very good, 3 = good, 2 = needs improvement, and 1 = inadequate): teaching skills, problem solving, work habits, relationships, communication skills, and attitude. Four of the seven teachers involved during the 1987-88 year achieved perfect scores in all areas, one received one rating of "2" on the first scale and one "4" on the second, and the other two received "4"s in three and four areas of the second scale, respectively. These ratings were consistent with those given in the first year of the project, and reflect improved performance on the part of those teachers who did not receive the maximum.

4. ***Site Review.*** A formal site review was conducted on May 11-13, 1988, as a part of a continuous effort to verify that treatment was taking place as planned. The EIRI Site Coordinator met with both Richardson and Sunshine Coordinators as well as with parents, ancillary staff, and all home teachers. In addition, the EIRI Site Coordinator attended seven home visits to observe each teacher at work.

   Results of the site review indicated that the project was well organized and implemented. The program files were in good order, containing up-to-date IEPs, quarterly reports of progress, assessment information, and description of services received. Seven IEPs were randomly selected for detailed review, and all of them contained the following: (1) a statement of current level of performance (both norm and criterion referenced; (2) annual goals and short-term objectives that were functional, appropriate, and individualized; (3) evaluation of criteria for determining when the objectives were met; and (4) timelines for monitoring.

The same folders were reviewed for assessment information and evidence of a multidisciplinary approach was indicated through speech/language, OT and PT evaluations. In addition, criterion-referenced measures such as the Hawaii and the ELAP were in evidence in all the folders.

The teachers demonstrated well-organized lesson plans, procedures for data collection, appropriate use of materials and activities, good rapport with the families, and excellent skills with young handicapped children. The home teachers were primarily paraprofessionals; however, their teaching demonstrates excellent experience and training.

Both the Sunshine and Richardson programs included well defined procedures for transitioning children into other programs. Transition plans include discussions of the transition with parents, taking parents to visit new programs, conducting meetings with parents and current and future staff, and often sending a home teacher with the child for the first few days. A follow-up system has been developed and program staff maintain contact with parents and the staff who have received the child.

Based on the 1988 site review, and a less formal visit in May, 1989, it was determined that treatment was implemented as planned. The site had requested technical assistance in the areas of functional programming for the severely handicapped and activities to meet family needs. The EIRI site coordinator did a workshop with them in January 1988 on assessment and functional skill development for severely handicapped.

Cost of alternative interventions. Data from the economic evaluation are presented in Table 4.6. These data indicate that providing twice the standard intervention doubled the cost of services for a home-based model. This relationship holds true whether or not costs of parent time are included, and assumes that administrative costs (as well as actual service delivery costs) are doubled by the expansion of time. Specific costs included in the analysis are personnel (salary and benefits devoted to the preschool program), facilities equipment, materials and supplies, and other miscellaneous costs (Table 4.6). The cost of parent time, that is, time spent in home visit activities and time spent transporting children for therapy sessions, appears at the bottom of the Table. This is a cost that is often ignored in economic analyses of preschool programs and was computed based on interviews with the parents concerning the distance to the center and the driving time, using the national average wage of $10.50 per hour.

Table 4.6

Cost Per Child for Sunshine School/Richardson Center (1987-88)

Resources	Expanded Intensity (N = 27)	Standard Intensity (N = 36)
Agency Personnel:		
Direct Service	$3,967	$1,984
Administrative	1,517	758
Facilities	513	257
Equipment	108	54
Materials/Supplies	223	111
Staff Transportation	361	181
Miscellaneous	738	369
Subtotal	$7,427	$3,714
Contributed Resources:		
Parent time	848	558
Parent Travel	304	152
Volunteer	29	15
Subtotal	$1,181	$ 725
TOTAL	$8,608	$4,439

Data Collection

Data concerning child and family functioning were collected at enrollment and annually thereafter. Results of each data collection effort are presented below, following a description a testing procedures.

Recruitment, training, and monitoring of diagnosticians. There were three diagnosticians and a local assessment supervisor who were trained and certified by EIRI standards. None were employed by either service provider, and testing assignments were made by the assessment supervisor to ensure that all diagnosticians were unaware of subjects' group placement. The diagnosticians possessed masters degrees in psychology, and the supervisor had his Ph.D. The assessment supervisor was responsible for shadow scoring 10% of each diagnostician's test administrations, scheduling testing, and collecting, reviewing, and sending all protocols to the EIRI site coordinator.

Interrater reliability for the BDIs that were shadow scored were calculated by dividing the number of agreements by the total number of items administered. Reliability coefficients averaged .95 (range .80 to 1.00) and suggest that the testers are performing well.

Pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. Children were administered the Battelle Developmental Inventory, and parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Evaluation Scales as pretest measures. Parents were paid a $20 incentive for pretesting. As explained later, data from these measures were used as covariates in the analyses as well as for investigating whether certain types of families or certain types of children benefited more from intervention than others.

Posttest #1. First year posttest data were collected on 71 children. Data were collected in May and June, 1987, for the first cohort and in May and June, 1988, for the second. Measures included the BDI and the Sequenced Inventory of Communication Development (SICD), in addition to the various parent questionnaires mentioned above. In addition, a parent satisfaction with treatment questionnaire and parent report of child's health are administered at posttest. The SICD was chosen because of the intervention emphasis on language development. Pretest demographic data and treatment verification data were used in the analyses to improve the generalizability of our data by allowing us to control for family demographic differences and differences in the intensity of the intervention.

Posttest #2. Second year posttest data have been collected on 58 children to date, with testing conducted in May and June, 1988, for Cohort 1 and May and June, 1989, for Cohort 2. Measures of child functioning included the BDI, SICD, and the Vineland, and the standard set of parent measures was again administered.

Posttest #3. Third year posttest data have been collected on 41 children to date, with testing conducted in May and June, 1989. Eleven children (6 standard intensity and 5 expanded intensity) who missed scheduled testing sessions are being pursued for future appointments, and 4 children (all expanded intensity) who have moved will soon be tested, as noted earlier. Measures of child functioning included the BDI, SICD, and Vineland, and the standard set of parent measures was again administered.

Results and Discussion

Comparability of Groups on Pretest Measures

Pretest data from child and family measures appear in Table 4.7. No statistically significant pretest differences were found in any BDI domain, although the high intensity group performed at higher DQ levels in all domains. Family measures also revealed no statistically significant pretest differences.

Measures of Child Functioning

Results of the posttests conducted thus far are contained in Table 4.8. Battelle pretest data (in each domain) were the best predictors of Battelle posttest scores, with correlations ranging between .67 and .96. All correlations were statistically significant at the $p < .001$ level. Regression analyses indicated that when BDI total DQ (Age Equivalent/Chronological Age) was used as a correlate of child functioning measures, other variables, including family data, did not account for a statistically significant additional amount of variance in outcome measures. Maternal education, as described below, did account for a difference found in the communication domain, and was therefore included as a covariate in all BDI analyses. Thus, pretest BDI Total DQ and maternal education were used as covariates in the

Table 4.7

Comparability of Groups on Pretest Measures for Sunshine/Richardson Treatment Intensity Study at First, Second, and Third Posttest

	Children Participating in Posttest #1										Children Participating in Posttest #2										Children Participating in Posttest #3									
	Standard Intensity				Expanded Intensity						Standard Intensity				Expanded Intensity						Standard Intensity				Expanded Intensity					
	$\bar{x}$	SD	%ile	n	$\bar{x}$	SD	%ile	n	ES	p Value	$\bar{x}$	SD	%ile	n	$\bar{x}$	SD	%ile	n	ES	p Value	$\bar{x}$	SD	%ile	n	$\bar{x}$	SD	%ile	n	ES	p Value
● **Battelle Developmental Inventory (BDI)**																														
DQs for:																														
Personal-Social	48.1	28.4		29	54.8	23.1		42	.27	.28	49.9	27.4		25	52.6	22.1		33	.11	.66	50.6	31.7		18	54.7	22.2		23	.16	.63
Adaptive Behavior	46.8	26.7		29	59.4	25.6		42	.48	.05	49.6	26.4		25	57.1	25.3		33	.10	.29	49.1	28.1		18	59.1	26.1		23	.37	.24
Motor	42.9	25.8		29	54.1	26.9		42	.42	.08	42.9	25.6		25	52.5	28.2		33	.35	.19	47.3	27.2		18	50.2	29.2		23	.10	.74
Communication	41.2	27.7		29	50.8	24.6		42	.37	.12	43.6	27.5		25	49.0	24.9		33	.23	.36	48.7	28.9		18	50.1	26.3		23	.05	.87
Cognitive	44.6	26.0		29	57.4	27.2		42	.48	.05	45.4	25.9		25	54.1	25.6		33	.34	.16	47.5	25.4		18	54.9	26.9		23	.28	.38
TOTAL	45.0	25.5		29	55.6	24.5		42	.43	.08	46.1	26.8		25	53.5	24.9		33	.29	.27	49.5	26.5		18	54.6	25.5		23	.20	.54
● **Parenting Stress Index (PSI) Percentile Rank**[+]																														
Child Related (range 50 to 235)	121.1	27.3	89	29	120.1	23.6	88	38	.04	.88	118.8	28.2	87	25	120.1	22.1	88	29	-.05	.22	125.2	26.6	92	18	116.2	21.9	85	23	.36	.26
Other Related (range 74 to 200	127.6	31.9	63	29	133.8	29.9	72	38	-.20	.42	124.9	30.3	58	25	136.3	29.3	74	29	-.38	.85	126.5	29.4	61	18	129.3	26.6	65	23	-.10	.75
TOTAL (range 137 to 328)	248.8	54.2	79	29	254.0	48.6	82	38	-.10	.68	243.7	53.1	75	25	256.4	45.9	84	29	-.44	.46	251.7	52.7	81	18	245.5	41.2	77	23	.13	.67
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[&]																														
Discrepancy	11.9	11.4		29	10.8	7.5		40	.12	.66	13.9	11.5		25	11.1	8.0		31	.29	.29	9.7	9.8		18	11.2	7.5		22	-.18	.58
Adaptability (range 0 to 24)	5.4	5.0		29	4.8	31.1		40	.15	.52	5.3	5.2		25	4.9	3.3		31	.10	.67	5.3	4.0		18	5.4	3.6		22	-.03	.90
Cohesion (range 0 to 30)	5.3	4.8		29	4.3	3.0		40	.27	.30	5.1	5.0		25	4.6	3.1		31	.13	.62	5.3	4.2		18	4.7	3.0		22	.17	.58
TOTAL	10.6	8.0		29	9.1	3.8		40	.27	.28	10.5	8.3		25	9.4	4.1		31	.18	.55	10.6	7.1		18	10.1	3.9		22	.09	.78
● **Family Resource Scale (FRS)**[@]	115.4	25.3	44	29	114.6	20.0	42	41	-.04	.87	115.0	26.2	44	25	113.9	19.0	40	33	-.05	.16	116.1	25.4	46	18	114.0	15.6	41	23	-.11	.75
● **Family Support Scale (FSS)**[@]	29.1	11.7	54	29	30.0	12.2	57	42	.10	.75	30.8	11.2	59	25	29.6	13.0	57	33	-.10	.40	30.3	12.0	59	18	32.0	13.7	66	23	.13	.69
● **Family Index of Life Events (FILE)**[+]	8.9	4.8	48	29	11.6	8.2	31	40	.40	.12	8.5	5.2	51	24	12.2	7.6	28	31	.40	.07	8.6	4.8	51	18	11.0	6.2	34	22	.43	.18

NOTES:

[*] Statistical analyses for BDI scores were conducted using ratio Development Quotients (DQs) computed by dividing the 'age equivalent' (AE) score reported in the technical manual for each child's raw score by the child's chronologial age at time of testing.

[+] Scores for the latter three subscales of the FACES are derived from the 'ideal' score reported in the technical manual. Scores reported in the table indicate the distance from 'ideal' in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[+] Percentiles for the PSI and FILE are based on raw score averages, and the percentiles reported are taken from normative data.

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Table 4.8

Analysis of Covariance* of Child Functioning for Alternative Intervention Groups for the Arkansas Intensity Study at First, Second, and Third Posttest

	Children Participating in Posttest #1										Children Participating in Posttest #2										Children Participating in Posttest #3									
	Standard Intensity				Expanded Intensity						Standard Intensity				Expanded Intensity						Standard Intensity				Expanded Intensity					
	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value
• **Battelle Developmental Inventory (BDI) DQs for:**+																														
Personal/Social	45.4	23.6	49.7	29	55.8	22.6	51.5	42	.08	.61	50.0	28.9	53.4	25	60.0	29.0	56.6	33	.11	.52	51.0	29.3	55.0	18	64.5	33.0	60.5	23	.17	.44
Adaptive Behavior	49.1	28.7	54.0	29	58.9	24.6	54.1	42	.01	.98	48.9	30.7	54.1	25	56.5	24.5	53.4	33	.05	.78	49.5	27.5	52.5	18	60.6	31.2	57.7	23	.17	.35
Motor	46.0	28.3	50.6	29	58.7	28.6	54.1	42	.12	.42	46.5	33.7	51.9	25	54.4	28.7	51.0	33	-.03	.87	50.4	34.1	52.9	18	54.9	30.4	52.4	23	-.02	.94
Communication	39.5	25.2	44.0	29	58.8	28.9	54.1	42	.36	.02	42.0	27.7	45.2	25	52.4	24.3	49.3	33	.16	.32	46.8	27.5	49.9	18	53.1	29.5	49.9	23	.00	.99
Cognitive	52.3	32.5	57.7	29	57.1	26.1	51.7	42	-.21	.13	47.2	31.1	50.8	25	55.4	29.3	51.7	33	.03	.85	54.2	31.3	56.8	18	55.4	32.2	52.8	23	-.13	.55
Total	46.2	25.2	50.9	29	57.6	22.4	52.8	42	.06	.47	46.8	27.4	50.0	25	55.7	24.0	52.4	33	.09	.50	49.6	26.2	52.4	18	57.3	27.7	54.5	23	.06	.69

NOTES: * Total BDI DQ and maternal education were used as covariates in all analyses.

+ Statistical analyses for BDI scores were conducted using ratio Development Quotients (DQs) computed by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

ANCOVAs, with treatment groups (expanded intensity vs. standard intensity) as the independent variable and the Battelle DQs as dependent variables. Significant adjusted mean differences were found only at first posttest, and only in the communication domain. This one significant difference is most likely to be a random effect as evidenced by both the absence of significant differences in later posttests and the average effect sizes for each posttest session (.07 for both first and second posttest and .05 for third posttest).

Measures of Family Functioning

Posttest analyses of family functioning measures are presented in Tables 4.9. Pretest scores indicated in the tables were included as covariates for posttest scores. No statistically significant differences were found for any of the parent measures, except that parents in the expanded intensity group reported significantly more stress at third posttest, and less total support (number of sources and level of support provided) at second posttest. The difference in stress found at third posttest can be attributed in part to the incomplete sample at this point. A two way ANCOVA indicated a statistically significant group by participation interaction for child related stress, but not in a direction that would explain the third posttest difference (Table 4.10). That is, parents in the standard intensity group who have completed third posttesting reported more stress at pretest than those who have not completed the third posttest, while the opposite is true for parents in the expanded intensity group (parents in this group who have completed third posttesting reported less child related stress than those who have not completed third posttest). This finding, then, does not explain the difference in stress reported at third posttest. Further analyses will be conducted to clarify the finding, should it not be a random effect.

Table 4.9

Posttest Measures of Family Functioning for Alternative Intervention Groups for Sunshine: First Posttest

Variable	Covariates[^]	Standard Intensity $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	Expanded Intensity $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	Effect Size	P Value
• **Parent Stress Index (PSI)**[*]													
Child Related	4	115.3	(26.1)	116.9	86	28	116.8	(23.2)	115.2	82	38	.07	.70
Other Related	3	128.4	(30.0)	132.0	70	28	134.9	(27.2)	131.3	68	38	.02	.85
Total	4	243.7	(52.1)	247.6	78	28	251.7	(44.6)	247.8	68	38	.00	.98
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]													
Discrepancy Score	1,2,7	12.0	(10.8)	11.5		26	8.0	(6.3)	8.4		36	.35	.12
Adaptability Range (0 to 24)	1,5	5.3	(3.6)	5.2		29	4.7	(3.8)	4.9		37	.08	.75
Cohesion Range (0 to 30)	6	5.4	(4.8)	5.2		29	4.2	(2.7)	4.4		39	.21	.33
Total Range (0 to 54)	8	10.8	(5.9)	10.4		29	8.9	(4.9)	9.2		39	.22	.28
• **Family Resource Scale (FRS)**[$#]	3,7,9	111.8	(21.9)	111.4	37	28	115.8	(20.0)	116.2	46	36	2.26	.14
• **Family Support Scale (FSS)**[$#]	5,7,8	30.1	(14.3)	30.8	63	28	29.1	(13.2)	28.3	50	38	.91	.34
• **Family Index of Life Events (FILE)**	1,7,8	7.8	(6.1)	8.7	47	28	10.3	(6.9)	9.4	47	34	.41	.53

NOTES:

[*] Statistical analyses for PSI and FILE were based on raw scores where low raw scores are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[$] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores are considered better.

[+] Scores for the latter three subscales of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[^] Covariates: 1 = FILE; 2 = FACES Discrepancy; 3 = PSI Other; 4 = PSI Total; 5 = FACES Adaptation; 6 = FACES Cohesion; 7 = FRS Total; 8 = FACES Total; 9 = Mother's marital status

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Table 4.9 (cont'd)

Posttest Measures of Family Functioning for Alternative Intervention Groups for Sunshine: Second Posttest

Variable	Covariates[^]	Standard Intensity $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	Expanded Intensity $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	Effect Size	P Value
• **Parent Stress Index (PSI)**[*]													
Child Related	4	113.3	(28.6)	115.2	82	24	117.3	(26.9)	115.5	85	29	-.01	.85
Other Related	4	124.6	(31.9)	128.8	65	24	138.4	(26.5)	134.3	72	29	-.19	.19
Total	3	237.9	(56.8)	241.9	73	24	255.8	(45.6)	251.7	81	29	-.19	.24
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]													
Discrepancy Score	2,5,7	15.5	(19.1)	16.2		25	11.0	(8.2)	10.3		31	.42	.06
Adaptability Range (0 to 24)	1,6	6.5	(3.5)	6.5		25	5.8	(3.9)	5.8		31	.19	.52
Cohesion Range (0 to 30)	6	6.7	(4.4)	6.6		25	5.4	(3.4)	5.5		31	.28	.27
Total Range (0 to 54)	8	13.2	(6.0)	12.9		25	11.1	(5.8)	11.4		31	.25	.26
• **Family Resource Scale (FRS)**[$#]	3,7,9	114.2	(26.8)	113.0	40	25	113.4	(16.3)	114.6	43	29	.07	.72
• **Family Support Scale (FSS)**[$#]	5,7,8	35.4	(15.9)	35.7	75	21	26.5	(10.6)	26.2	45	31	-.69	.00
• **Family Index of Life Events (FILE)**	1,3	8.1	(7.2)	8.9	47	24	9.4	(6.7)	8.6	47	25	.04	.83

NOTES:

[*] Statistical analyses for PSI and FILE were based on raw scores where low raw scores are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[$] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores are considered better.

[+] Scores for the latter three subscales of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[^] Covariates: 1 = FILE; 2 = FACES Discrepancy; 3 = PSI Other; 4 = PSI Total; 5 = FACES Adaptation; 6 = FACES Cohesion; 7 = FRS Total; 8 = FACES Total; 9 = Mother's marital status

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Table 4.9 (cont'd)

Posttest Measures of Family Functioning for Alternative Intervention Groups for Sunshine: Third Posttest

		Standard Intensity					Expanded Intensity						
Variable	Covariates^	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	Effect Size	P Value
• **Parent Stress Index (PSI)***													
Child Related	4,5	112.8	(27.6)	110.6	75	18	120.2	(28.1)	122.5	90	21	-.42	.03
Other Related	3,5,7	122.4	(27.7)	122.6	55	18	135.6	(31.4)	135.4	73	21	-.43	.04
Total	3,5	235.2	(50.4)	237.0	65	18	255.1	(53.2)	253.3	84	22	-.31	.03
• **Family Adaptation and Cohesion Evaluation Scales (FACES)+**													
Discrepancy Score	2	9.4	(7.8)	9.2		17	13.6	(14.8)	13.8		23	-.39	.37
Adaptability Range (0 to 24)	1,5	6.4	(2.9)	6.4		17	4.4	(3.4)	4.4		23	.61	.05
Cohesion Range (0 to 30)	6	6.0	(4.3)	6.0		17	4.5	(4.0)	4.6		22	.33	.27
Total Range (0 to 54)	8	12.4	(6.7)	12.3		17	9.3	(6.2)	9.4		23	.45	.12
• **Family Resource Scale (FRS)$#**	5,7,8	117.6	(24.1)	117.2	48	18	114.0	(15.9)	114.5	43	22	-.14	.61
• **Family Support Scale (FSS)$#**	2	28.9	(15.7)	29.3	54	17	26.8	(11.2)	26.4	45	22	-.22	.47
• **Family Index of Life Events (FILE)**	3,6	7.3	(5.0)	7.4	62	18	10.1	(7.3)	10.0	40	22	.40	.08

NOTES:

* Statistical analyses for PSI and FILE were based on raw scores where low raw scores are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

$ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores are considered better.

+ Scores for the latter three subscales of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

^ Covariates: 1 = FILE; 2 = FACES Discrepancy; 3 = PSI Other; [illegible] = PSI Total; 5 = FACES Adaptation; 6 = FACES Cohesion; 7 = FRS Total; 8 = FACES Total; 9 = Mother's marital status

Table 4.10

Pretest Parent Stress Data:

Intervention Group by Third Posttest Completion Status

		Standard Intensity					Expanded Intensity					
Variable	Covariate^	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	P Value
Parent Stress Index (PSI)*												
Child Related	1											
Test not completed		111.3	(22.3)	109.7		15	123.8	(26.4)	125.0		16	.05
Test completed		125.2	(28.6)	124.8		18	116.2	(21.9)	117.1		23	
Other Related	1											
Test not completed		124.6	(32.7)	123.9		15	137.9	(35.0)	138.4		16	.45
Test completed		126.5	(29.4)	126.3		18	129.3	(26.6)	129.6		23	
Total	1											
Test not completed		235.9	(52.2)	233.6		15	261.8	(59.0)	263.4		15	.16
Test completed		251.7	(52.7)	251.2		18	245.5	(41.2)	246.7		23	

NOTES:

* Statistical analyses for PSI were based on raw scores where low raw scores are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

^ Covariate: 1 = BDI total pretest DQ

Scores reported for the FACES represent first the difference between the perceived versus the ideal family functioning style, and the distances from the ideal, or center point, in each domain (i.e., adaptation, cohesion, and total). These distances were computed by subtracting the actual score parents received from the median score ported by Olson and McCubbin (1983) in both the cohesion and adaptation scales, and using the absolute value of negative scores. The scores range from 0 to 30 in the cohesion domain and from 0 to 26 in the adaptability domain. Total distance was the simple sum of the cohesion and adaptability distances. The large negative effect sizes for the FACES domains at third posttest suggest that parents in the expanded intensity group are closer to the "ideal" family in their functioning style, yet these families also had substantially higher discrepancy scores, as indicated by the .31 effect size.

Subgroup Analyses

Subgroup analyses concerning mother's years of education, children's health status, and teacher ratings of parent involvement have been conducted thus far. Only parent involvement has been found to produce large effects (Table 4.11). Parents were rated as "highly involved" if their total teacher rating score ranged from 7 to 9 and those rated as "less involved" if their total score was 6 or less. Although differences found between these groups only approach statistical significance, the effect sizes in three BDI domains (personal-social, communication, and cognition) at second and third posttest average .34 and .42, respectively. This increasing effect size suggests that parent involvement in a home visit program can have a positive long term effect on a child's developmental outcome. Table 11 also indicates that parents who were rated as "highly involved" had children with more severe delays as indicated by BDI pretest total DQ. These parents may have stronger motivation to work with their children due to the severity of the delay than parents in the group rated as "less involved."

Conclusions

The absence of statistically significant differences between groups in child suggests that increases in intensity from once to twice per week in a home visit program do not produce significant improvements in child functioning. Those differences that were found in the communication domain at first posttest disappeared when maternal education was used as an independent variable (12 years or more vs. less than 12 years) in the analysis. For this reason, maternal education was used as a covariate in all analyses of BDI data. Third year data are not yet complete, but no group differences in child functioning are emerging with

Table 4.11
Analysis of Covariance* of Child Functioning for Level of Partent Involvement for the Arkansas Intensity Study at First, Second, and Third Posttest

	Children Participating in Posttest #1										Children Participating in Posttest #2										Children Participating in Posttest #3									
	Low Involvement				High Involvement						Low Involvement				High Involvement						Low Intensity				High Intensity					
	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value	$\bar{x}$	SD	Adj. $\bar{x}$	n	$\bar{x}$	SD	Adj. $\bar{x}$	n	Effect Size	p Value
● **Battelle Developmental Inventory (BDI) DQs for:** +																														
Personal/Social	55.6	18.5	51.5	39	46.7	27.8	50.8	32	-.03	.85	58.9	23.2	50.0	34	51.2	36.0	60.1	24	.35	.07	61.5	23.8	52.0	23	54.8	40.3	64.3	18	.39	.10
Adaptive Behavior	60.5	20.1	54.8	39	48.1	31.8	53.8	32	-.04	.79	60.9	23.8	51.8	34	42.3	28.7	51.4	24	-.01	.93	64.0	24.7	54.3	23	45.2	32.9	54.9	18	.02	.92
Motor	462.8	25.3	56.6	39	42.2	29.6	48.5	32	-.28	.07	62.4	27.9	52.1	34	37.0	29.0	47.3	24	-.16	.42	60.0	25.4	50.3	23	43.8	37.2	53.6	18	.10	.67
Communication	53.8	21.3	48.4	39	47.2	33.9	52.6	32	.15	.38	52.1	22.9	42.7	34	42.1	29.6	51.4	24	.33	.07	53.1	22.0	44.1	23	46.6	35.4	55.6	18	.40	.09
Cognitive	59.7	22.5	53.0	39	49.7	34.6	56.3	32	.11	.43	56.8	25.5	45.9	34	44.8	34.9	55.7	24	.33	.07	59.1	23.2	47.7	23	49.5	39.7	60.9	18	.42	.05
Total	58.6	17.9	53.2	39	46.0	28.8	51.3	32	-.06	.49	57.9	21.3	48.6	34	43.2	29.2	52.6	24	.18	.32	59.3	21.0	49.6	23	47.1	34.2	56.8	18	.26	.20
Pretest BDI DQ	57.5	19.1		39	43.6	29.8		32	-.58	.02	59.0	19.0		34	37.9	27.7		24	-.93	.00	61.5	19.8		23	41.7	28.2		18	-.84	.01

NOTES:

[*] Total BDI DQ and mother's years of education were used as covariates in all analyses.

[+] Statistical analyses for BDI scores were conducted using ratio Development Quotients (DQs) computed by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[^] SICD score represents the average number of months that the child's measured age of receptive and expressive speech deviates from their chronological age. Negative numbers indicate performance below age level.

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nearly 2/3 of the data in. Thus, it appears that the intensity difference employed in this investigation is not producing significant gains in child performance or family functioning. This is not to say that larger differences in treatment intensity would not result in group differences, but does indicate that if services can only be expanded from once to twice per week, resources may be better spent identifying and serving additional children or meeting other needs. Given the findings from the analysis of parent involvement, serious consideration should be given to the Sandow et al. (1981) recommendation that intervention be more intense when it is first delivered and be tapered off as parents gain skill and comfort with their own abilities.

Future Plans

We are continuing to contact families that missed appointments for posttesting and to contact families that have moved or for other reasons not participated in posttest sessions. To date, families of six of the children that have moved (two moved prior to second posttest and four moved after second posttest) have been contacted to arrange for testing, data on one of whom have been received and are included in this report.

Further data analyses will include additional subgroup analyses focusing on other variables that may affect child or family outcome, such as maternal employment status, marital status, and other variables that are suggested by the data.

Contacts will also be made with schools that children now of school age are attending in order to arrange collection of attendance and other relevant data from their teachers. When all of the 1989 data are available, tables will be developed presenting children's age at enrollment, length of enrollment in home-based, center-based, and other preschool services.

Two visits to the site will be made during the 1989-90 academic year, one in winter and one in spring. The purpose of these visits will be to review charts of any children still being served by the Sunshine Program and the Richardson Center, to facilitate arrangements for 1990 posttesting, and to talk with staff and parents about the possibility of continuing to follow the children and families for another five years. The willingness of both program staff and parents to continue participation for five more years will be assessed and preliminary plans for follow-up will be discussed. An additional purpose of the spring visit will be to observe three or four posttest sessions. This visit will be scheduled as early in the posttest period as possible to enable the site coordinator to provide feedback to the examiners and the assessment coordinator.

Finally, given the experiences of the past two years, 1990 posttesting will begin earlier, allowing time for repeat appointments and locating children who have moved.

NEW ORLEANS ASSOCIATION FOR RETARDED CITIZENS

Project #5

COMPARISON: Severely Handicapped Infants--Center-based developmental intervention delivered by paraprofessionals trained through an inservice model vs. the center-based developmental intervention delivered by paraprofessionals trained through an intensive, in-classroom model.

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LOCATION: New Orleans, Louisiana

DATE OF THE REPORT: 10-9-89

Rationale for the Study

There is a chronic and critical shortage of certified personnel in early childhood special education (McLaughlin, Smith-Davis, & Burke, 1986). This shortage is especially acute in rural and inner-city areas (Huntington, 1988; McLaughlin et al., 1986). With the passage of P.L. 99-457, this shortage will likely increase as early childhood intervention programs grow to provide services to a greater number of children. At present, partly as a result of this shortage, it is not uncommon to have noncertified personnel providing services to young children who are handicapped (Huntington, 1988; Teaching Resources, 1985; Weiner & Koppelman, 1987). The possibility of using noncertified individuals, supervised by appropriately trained and certified/licensed personnel, as interventionists in early childhood programs has been discussed as an appropriate and feasible strategy (Innocenti & White, 1988; Peters & Deiner, 1987). In fact, Head Start, the largest provider of early intervention services in the United States, is primarily staffed by trained paraprofessionals. A question raised by this strategy for staffing early intervention program is what levels of training and support are required for these noncertified individuals to deliver effective services (Peters & Deiner, 1987). The purpose of this study was to determine whether the addition of systematic training, ongoing technical support and assistance, and expanded materials and equipment to a program that used noncertified personnel as interventionists would result in enhanced child growth and improved family functioning when compared with the existing program.

Review of Related Research

For the purposes of this report, noncertified personnel will be referred to as paraprofessionals and defined as any individual, including those with a university degree and/or formal certification, who is providing services to a child in an area in which he/she is not specifically certified (Pezzino, 1984). Research on the effectiveness of paraprofessionals has demonstrated that paraprofessionals can teach new skills to handicapped children (Fredericks, Baldwin, Moore, Templeman, & Anderson, 1980; Guess, Smith, & Ensminger, 1971; Phillips, Liebert, & Poulos, 1973; Schortinghais & Frohman, 1974; Shearer & Shearer, 1972). A difficulty with the majority of this research is that intervention vs. no intervention was compared, and, therefore, it is difficult to determine whether paraprofessional training procedures result in intervention that is any better for children and families than what they would have received in the absence of special training to the paraprofessional.

The most commonly used training procedures for paraprofessionals consists of orientations and inservice sessions (Frith & Lindsey, 1982). Research studies investigating these common approaches generally provide information only on changes in teacher knowledge and attitudes (Farrell, 1982; Johnson & Ferryman, 1969).

Information that has been presented on teacher behavior as a result of this inservice, classroom-type training has not been positive (Farrell, 1982). Data on how these teacher changes affect the children with whom they are working is usually not presented.

An alternative to this inservice training model for paraprofessionals is the therapy or collaborative consultant model (Striefel & Cadez, 1983). With this model, a certified professional provides the assessment of the handicapped child and outlines the programming to be given. The professional trains the paraprofessional in the implementation of a program and in data collection practices until the paraprofessional meets a specified criteria. The paraprofessional then assumes responsibility for the program. The professional makes regular contacts with the paraprofessional to observe the implementation of the program, provide feedback (and retraining if necessary), check the program data, and make program changes as needed.

A variation of the therapy consultant model was used by the Social Integration Project (SIP) to provide services to children who were handicapped and were placed in an integrated daycare center where the primary teaching staff were paraprofessionals (Rule, Killoran, Stowitschek, Innocenti, & Striefel, 1985; Rule et al., 1987). Handicapped children in SIP demonstrated significant skill increases while in the program, and paraprofessional attitudes were positive toward the program (Rule et al., 1987). Children in the SIP program were also compared to matched children in a professionally staffed intervention program (Rule et al., 1987). Results indicated no difference between programs on measures of child functioning.

The results of the studies reviewed above suggest that paraprofessionals can be effective intervention agents. A variety of training procedures for paraprofessionals have resulted in children making development gains, but comparative studies of different training procedures are rare. A comparative study of a paraprofessional versus a professional implemented intervention program found no difference in child functioning (Rule et al., 1987). Unfortunately, this study was confounded in that the paraprofessionally implemented program was mainstreamed (it occurred in a daycare setting that mixed children with and without handicaps) and the other was not, children were matched and not randomly assigned to groups, and the size of the subject sample was small.

The current study will partially replicate the Rule et al. (1987) study while avoiding some of the confounds they encountered. Random assignment was used to assign subjects to groups, and a larger subject sample was employed. Another difference from the Rule et al. study is that this study compared the effect of two different methods of training paraprofessionals (variation of the consultant versus the inservice model) on child and family functioning. A final difference is that this research occurred in an inner-city intervention program, an identified personnel shortage area (McLaughlin et al., 1986), rather than a suburban setting.

Overview of Study

This study contrasted a commonly-used paraprofessional service and training model with a paraprofessional service model that included a more intensive training component in a center-based, inner-city service program. The purpose of this study was to provide information on the effect of these different training procedures on intervention success as measured by child and family functioning, while considering cost-effectiveness data. The Association for Retarded Citizens (ARC) in New Orleans provided center-based developmental intervention services for handicapped children from birth to 3 years of age. The ARC provided services in an inner-city area and used paraprofessional staff to implement the program. These staff were traditionally trained through monthly inservice sessions and had limited supervision or contact with professional personnel. The ARC was separated into two programs for this study. One program carried on without change (basic program). In this program, staff continued to receive monthly inservice sessions. The other program was augmented

(augmented program) through training from professionals using a variation of the therapy consultant model. Training for the augmented program focused on increasing the structure of the program by teaching systematic intervention strategies, by providing ongoing technical assistance and support, and by providing expanded materials and equipment.

Results from the study provide important information in a number of areas not usually addressed. (1) Although the primary focus was on child growth, benefits to the family were possible, and measures of family functioning were obtained. Family functioning has been an overlooked area of early intervention research in the past (Casto & Mastropieri, 1986; Dunst, 1986). (2) Under P.L. 99-457, many programs will have to engage in training and certification of some type with their noncertified personnel to come into compliance with the law (Innocenti & White, 1988; Peters & Deiner, 1987). Knowledge regarding the efficacy of various training methods will be needed. (3) The ARC program is not atypical of what now exists in many rural and inner-city programs (Huntington, 1988; Teaching Resources, 1985). (4) Cost-effectiveness data from different approaches will be important for making administrative decisions.

Methods

This study was conducted in conjunction with the New Orleans Association for Retarded Citizens (ARC). The ARC is a nonprofit, United Way agency and is affiliated with both the National ARC and Louisiana ARC. The ARC is governed by a board of directors composed of experts in the field of education for the handicapped, consumers of the services, and people in the community. The ARC receives funding from United Way and the Louisiana Office of Mental Retardation and Developmental Disabilities. The ARC is the largest provider of services to children with handicaps in the age range from birth to 3 years in the greater New Orleans area. The ARC provided advocacy services for the handicapped, parent information services, and operates an information cooperative. When this study was conducted, the ARC operated three centers to provide services to children (the Main, Jefferson, and West Bank sites) and operated a work activities center for adults with handicaps at the Main site. The ARC offered a 5-day-per-week, center-based program that operated from 9:00 a.m. to 3:00 p.m. for handicapped children in their catchment area.

The intervention programs studied as a part of this project occurred over a 2-year period; the 1986/87 and 1987/88 academic years. During the first year, two classrooms at the Jefferson and West Bank sites, and three classrooms at the Main site participated in the research. At each site, teachers were randomly assigned to either a basic or augmented classroom (two basic classes at the Main site). During the second year, only two of the sites (Main and West Bank) participated in the research due to internal changes at the ARC. Six classrooms from these two sites participated (four classrooms at Main). Classrooms remained in the basic or augmented group dependent on the teacher's previous year assignment. The classroom and teacher new to the study at the Main site was designated an augmented classroom.

Due to delays in starting the research program, the first year of intervention was 6 months in length. The study began late in January 1987 and continued to August 1987. The second year of intervention coincided with the traditional academic year, from September 1987 to May 1988 (9 months).

Subjects. Subjects will be described according to time of enrollment (see Table 5.1). Forty-five children (24 basic, 21 augmented) between 10 and 34 months of age (mean = 23.7) participated in the first year of the study. Twenty-five of these subjects were male. Of these 45 subjects, 31 "graduated" to preschool programs operated by the local school districts. The remaining 14 (8 basic, 6 augmented) continued in classrooms of their assigned group. Of these 14 (8 males), the ages at program entry ranged from 12 to 22 months (mean = 16.1).

During the second year, 19 new subjects (8 basic, 11 augmented) began participation in the research. Ages of these subjects ranged from 12 to 32 months (mean = 23.0). Ten of these subjects were male.

Table 5.1

Number of Subjects and Group Placement by Year for ARC Paraprofessional Training Study

n	Feb. 1986 - - - 6 mos - - - Aug. 1987	Sept. 1987 - - - 9 mos - - - May 1988
15	Augmented	Public School
17	Basic	Public School
6	Augmented	
7	Basic	
8		Augmented
11		Basic
64		

The primary analyses for this report is on all subjects who have received interventions. This includes subjects who have received 6, 9, and 15 months of intervention. This group consisted of 64 subjects (32 basic, 32 augmented) ranging in age from 10 to 34 months (mean = 23.3) when they began intervention. Thirty-five were male. The age equivalents for the children, based on the total score of the Battelle Developmental Inventory (BDI) ranged from 0 to 27 months (mean = 5.6; SD = 10.9). The majority of these children were moderately to severely handicapped. Using a developmental quotient calculated by dividing BDI total age equivalent by chronological age and then multiplying by 100, 78% of the children had developmental quotients below 65. Almost half (48%) of the children had developmental quotients below 50.

Recruitment. The criterion the ARC used to identify a child as handicapped was established by the Louisiana Office of Mental Retardation and Developmental Disabilities. This criteria qualified a child as handicapped if he/she exhibited a mild delay in two or more developmental areas, a severe delay in one or more developmental area, or had a condition diagnosed by a physician that may lead to life-long developmental delays. The majority of children identified for service at the ARC had more involved handicaps; for example, 17 children in the study had Down syndrome, 8 had cerebral palsy, and 9 were multiply handicapped (the degree of involvement was also indicated by the developmental quotients of the children, as will be reported later).

All children and their families who were identified as handicapped and were scheduled to participate in the ARC program were considered for inclusion in the study. Services at the ARC were provided on a first come, first serve basis until all slots were filled. From this pool, subjects were included in the study based upon parents' willingness to participate prior to knowing which treatment group they would be assigned. Modifications were made in this procedure during the second year due to the Jefferson site not being available for the study. Parents at all three sites were initially informed of the study, but parents of children at Jefferson were later informed they could not participate. Informed consent to participate in this study was obtained from the parents. Parent failure to provide informed consent did not exclude a child from receiving services at the ARC.

Assignment to groups. Random assignment of teachers to classes (discussed earlier) was accomplished with coded information so that knowledge of which teacher was associated with which class was not known during subject assignment. The children at each site were categorized by 6-month age groupings. Independently, another set of researchers, who were familiar with the children's handicapping conditions, categorized children into three functional levels ranging from least to most impaired. Based on these categorizations, children were paired by functional level within age category (a 5 x 3 matrix). If pairings were not possible using this procedure, children within the same age categories were paired with children in an adjacent functional level category. If that procedure was not possible, children within the same functional level categories were paired within adjacent age categories. After all pairings were accomplished, a random procedure (coin toss) was implemented to assign one member of each pair to the basic condition and the corresponding pair member to the augmented condition.

During the second year, a similar procedure was followed. At each site, an age by functioning matrix was developed. This resulted in a 4 x 3 matrix, as only one child (a 12-month-old) was in the 0- to 12-month age range, and the 13- to 18-month grouping was expanded to include this subject. Subjects continuing from the first year were placed, in the matrix, in their assigned groups. The remaining subjects were randomly assigned to complete matrix pairings.

Attrition. In the first year (1986-87), 46 subjects participated in the study. One child (augmented) moved from the area during intervention and transferred to another program. Twenty-three subjects were pretested and began study participation at the beginning of the second year (1987-88). Four subjects (two basic, two augmented) withdrew from the study during the year. These subjects withdrew from all ARC program participation due to individual family problems. These five children were not posttested and are not included in analyses for this study.

Demographic characteristics. The subject pool for this research study is complete since the ARC has altered its service delivery patterns for the 1988/89 academic year. Further research efforts with ARC subjects will involve the collection of follow-up data on child and family functioning for children that were enrolled in this study.

Approximately 72% of the subjects in this study are Black. The majority come from low SES families; 60% of subjects reported annual incomes below $10,000. Approximately 45% of subjects come from families where both the mother and father live at home. Demographic characteristics for all children in the research are presented by group placement in Table 5.2. This table presents information on the comparability of groups. Probability values were obtained from t-tests.

Of the 17 variables presented, three (age of father in years at pretest, percent with both parents living at home, and percent of children who are Caucasian) approach being statistically significant at the $p \leq .05$ level. This is not surprising given the large number of comparisons made between groups. By examining the data on all variables, it appears that the groups are very comparable in terms of demographic characteristics. If there is any advantage between the two groups, it would have to be slightly in favor of the augmented group where percent with both parents living at home, percent of children who are Caucasian, and percent of mothers employed as technical/managerial or above is slightly but not statistically significantly higher. It should be noted that some concerns regarding parent report data have been raised by site staff. Parents in this study come primarily from low-income areas, and some

Table 5.2

Comparison of Groups on Demographic Characteristics for Subjects Receiving One and Two Years of Intervention for ARC Paraprofessional Training Study

	Basic Program			Augmented Program				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months at pretest	23.7	(6.5)	32	23.0	(7.2)	32	.70	-.11
• Age of mother in years+ at pretest	27.6	(7.4)	32	29.6	(7.3)	32	.30	.27
• Age of father in years+ at pretest	30.4	(6.2)	27	33.6	(7.8)	26	.11	.52
• Percent Male*+	53.1		32	56.3		32	.81	.06
• Years of Education--Mother	11.9	(2.1)	32	12.6	(1.9)	32	.22	.33
• Years of Education--Father	12.0	(2.0)	30	12.6	(2.3)	27	.23	.30
• Percent with both parents living at home*	31.3		32	53.1		32	.08	.45
• Percent of children who are caucasian*	18.8		32	37.5		32	.10	.42
• Hours per week mother+ employed	13.7	(18.8)	31	9.1	(16.3)	32	.31	.24
• Hours per week father+ employed	39.7	(9.1)	19	40.0	(19.8)	18	.96	.03
• Percent of mothers employed as technical managerial or above*	9.4		32	21.9		32	.17	.35
• Percent of fathers employed as technical managerial or above*	25.0		24	17.4		23	.53	-.18
• Median household income	$4,500	($20,694)	30	$4,500	($19,418)	30	.97	.01
• Percent with mother as primary caregiver*	90.9		22	92.3		26	.87	.05
• Percent of children in daycare more than 5 hours per week*	59.4		32	71.0		31	.34	.24
• Number of siblings+	1.2	(1.4)	32	0.9	(0.9)	32	.33	-.21
• Percent with English as primary language*	100		31	96.9		32	.99	.00

NOTES:

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

+ Effect sizes for these variables represent absolute values.

^ $$\frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$$

attempts at providing information that meet parent expectations of what the site staff would like to see, rather than actual information, may be occurring to some degree. Demographic questions related to income, occupation, and other potentially "sensitive" variables were left unanswered by some parents. Also, in families where both parents were not living at home, information on fathers was difficult to obtain.

Intervention Programs

The ARC offered two types of early intervention programs for young children who were developmentally delayed--(a) 5-day-per-week, center-based program that operated from 9:00 a.m. to 3:00 p.m.; and (b) an infant service program that provided 1 hour of intervention per week to infants with handicaps and their families at one of the three ARC sites. All children involved with the EIRI research were in the center-based program.

In the center-based program, the typical classroom organization contained eight children served by a teacher and aide. Teachers and aides were paraprofessionals, most teachers had a bachelor's degree, but none had teacher certification (see Table 5.3). Prior to the participation of the ARC in the EIRI research, classroom staff received training through general, agency-wide inservice sessions (see Table 5.4). Child goals and objectives were determined by consultants in the areas of speech and language and motor therapy, but these consultants interacted minimally with each other or with the classroom staff. Instructional activities occurred throughout the course of the day, but the quality and quantity of these activities varied.

Research at the ARC investigated two different methods for training paraprofessional teachers to work effectively with young children who are handicapped. The interventions consisted of a continuation of services as they had been provided in the past where classroom staff received training through inservice sessions versus an augmented condition in which some teachers and aides received in-classroom training from professional consultants who held a nationally recognized certification

Table 5.3

Educational and Teaching Experience of Teachers Involved in the ARC Paraprofessional Training Study

	Classroom Site	Education	College Major	Years Experience at ARC	Years in Study
BASIC CONDITION:					
Teacher #1	Main	Bachelor's Degree	Education	5	2
Teacher #2	Main	Bachelor's Degree	Home Economics	7	2
Teacher #3	Jefferson	Bachelor's Degree	Education	12	1
Teacher #4	West Bank	High School Diploma	**	10	2
AUGMENTED CONDITION:					
Teacher #5	Main	3 Years of College	**	10	2
Teacher #6	Main	3 Years of College	**	17	1
Teacher #7	Jefferson	Bachelor's Degree	Early Childhood	1	1
Teacher #8	West Bank	Bachelor's Degree	Early Childhood	3	2

* Major not presented unless teacher had a Bachelor's Degree

Table 5.4

Inservice Topics Presented to Teacher and Aides in ARC Paraprofessional Training Study

Academic Year	Total Inservice Hours	Topics
86/87	10	First Aid, CPR, Diabetes, Medications, Seizure Disorders,
87/88	20	Hearing Impairments, Classroom Materials, Prenatal Development, Physical and Motor Development, Infection Control, CPR, P.L. 99-457, Transition and Advocacy.

(teacher certification, CCC, OTR, etc.) and who had experience in early intervention. Tables 5.3 and 5.4 present information on the experience of teachers who were involved in the study and the inservices received, by teaching in both conditions, while the study was occurring.

Basic condition. In the basic condition, classroom practices were similar to those that were in effect prior to beginning the study and are similar to those described above. Paraprofessional classroom staff received a series of topical workshops throughout the course of the school year (see Table 5.4). As described, classroom staff in the basic condition had minimal contact with the professionals who recommend specific goals for children. A multidisciplinary therapy model was used that did not focus on staff communication. Teachers and aides were not trained in the implementation of specific curricula or in the implementation of specific child programs. For staff in the basic condition, no procedures for providing feedback on their child programs or on specific teaching techniques was available.

Children in these classrooms received Individual Habilitation Plans (IHPs) developed by teachers based on professional recommendations and on a teacher-administered criterion-referenced instrument (Harrison County checklist). Instructional activities were generally structured in a one-to-one teaching format.

Instructional activities occurred throughout the day, but no daily systematic learning plans were available. This created variability in the types and frequency of instruction that occurred within a class and across classrooms. The lack of a systematic strategy resulted in teaching practices that would not be considered "best practice" in special education. For example, instructional activities that were implemented in the basic classes were often not related to child goals, child progress through instructional sequences were often not data based, and appropriate teaching techniques were not consistently applied. Educational materials existed in these classrooms, but were not adequate to meet all child goals.

The teacher for each classroom established a daily schedule where activities were listed by general developmental areas; for example, gross motor time, fine motor time, cognitive time, etc. Activities that occurred during this time were teacher dependent. Some individualized activities occurred, but not systematically. During times when teachers worked individually with a child, no planned activities occurred for the other children.

Augmented condition. The experimental intervention, referred to as the augmented condition, involved the employment of a collaborative consultation model in the classrooms. Subjects attended ARC classrooms, staffed by similarly qualified staff, on the same days and for identical hours as subjects in the basic condition. For classrooms in this condition, the paraprofessional staff received training from professionals in their classroom throughout the school day. Professionals were from an interdisciplinary team from the Louisiana State University (LSU) Human Development Center. The professionals worked with classroom staff two to three times per week helping them to design and implement child specific programs. Professional staff were certified and experienced in infant early intervention.

Classroom staff were directly instructed in the purposes of various child objectives, were taught teaching strategies needed to meet specific objectives, and were provided regular feedback on their teaching techniques. The focus of teaching activities was on teaching children needed skills during naturally occurring classroom routines (i.e., incidental teaching methods during snack, music, free play, etc.; c.f., Haring & Innocenti, 1988). Child IHPs were collaboratively developed by classroom staff and professionals. In addition, materials and equipment needed to meet specific child and group goals or for various classroom activities were provided as necessary. This equipment included such items as: (a) adaptive equipment for physically handicapped children; (b) materials for specific programs (such as language cards, adapted bowls and spoons); (c) developmentally appropriate toys, where needed; and (d) additional food items to be used at snack times to aid in the implementation of incidental teaching programs.

Classroom staff in the augmented condition were trained in the use of a specific curriculum (Louisiana Curriculum for Infants with Handicaps) that included activities to meet objectives, as well as in adapting curriculum for specific child needs. The majority of instruction in this condition was provided through group individualized formats. That is, although the children were primarily in group settings, specific child skills were focused on within these settings so that each child received instruction appropriate to his/her skills and needs. The Individualized Curriculum Sequencing Model (Guess & Helmsletter, 1986) served as a framework for instructional activities.

Treatment Verification

A number of procedures were incorporated to verify that the interventions were being implemented as intended. Table 5.5 presents some of these data. One method to verify that treatment is received is to collect child attendance data. If a child does not attend a program regularly, then evaluating treatment effectiveness is confounded by their absence. Daily records on attendance were kept by ARC staff, and these records were forwarded to EIRI on a monthly basis. In addition to the attendance data, general health data on the children were also collected. Health factors can potentially effect child progress. No differences were found between the groups on either attendance or health factors (Table 5.5).

Many of the EIRI studies have an extensive treatment verification component that is related to parents. This emphasis on parents was minimal in this study. Parents of subjects were not required to be involved in their child's education except for attendance at one IHP meeting (children were bussed to and from school). This programs' de-emphasis on parents, along with related demographic factors (i.e., many parents did not have phones, project staff were prohibited from visiting federal

Table 5.5

Treatment Verification Data for ARC Paraprofessional Training Study

	Basic			Augmented				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[^]
• General health of child[&]	1.9	(0.6)	31	1.9	(0.6)	31	.83	.00
• Percent child attendance	71.1	(21.0)	32	77.9	(12.7)	32	.12	.32
• Parent Satisfaction[+]	24.1	(3.8)	32	23.4	(3.5)	27	.52	-.18
• Teacher rating of parents[#]	6.4	(2.3)	32	7.1	(2.1)	32	.27	.30
• Percent of children who received speech therapy[*]	6.9		29	3.6		28	.58	-.15
• Percent of children who received motor therapy[*]	32.1		28	25.0		28	.56	-.15

[&] Based on a parent rating of the child's health where: 1 = worse than peers; 2 = same as peers; 3 = better than peers.

[+] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] Data are based on parent report, obtained at posttest, of child time in the service during the past year, obtained outside of the ARC program

[^] $\frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$

housing projects for work-related activities, etc.), made obtaining parent related data difficult. Parent satisfaction with the intervention program and a parent report of other services the child may be receiving was obtained annually. These data are presented in Table 5.5. Parents in both groups were equally satisfied with their child's program. Parent reports of additional services did not result in the finding of group differences.

Teachers were also asked to rate their perceptions of each child's parents on dimensions of support, knowledge, and attendance. Because this rating was based on very limited contact between parent and teacher, these ratings should be interpreted with caution. Teachers' ratings of parents at the ARC did not result in group differences (Table 5.5), and most parents were positively rated.

Site review. An important aspect of treatment verification is the site review. The purpose of this review was to collect information about the nature and quality of early intervention services that were being delivered at the ARC, to verify that the research being conducted by EIRI was being implemented as intended, and to collect needs assessment data that may be useful to site administrators when seeking technical assistance.

The first site review was conducted April 24, 1987. The ARC was found to be complying with EIRI research expectations. Specific areas were reviewed, and clear differences between basic and augmented conditions were found. For interested readers, greater detail is given in the site review report available from EIRI.

The second site review was conducted on April 26 and 27, 1988 (a site review report is available). The process differed for this second review in two major respects: (1) The review team included a member not affiliated with EIRI, but a person who was familiar with early intervention practices. This member was David Sexton, Professor and Chair of Special Education, University of New Orleans. (2) Instead of treating the ARC as one program, the basic and augmented conditions were evaluated as if they were separate programs.

On a site review evaluation form (available from EIRI), the basic program received 75.3 of a possible 150 points, and the augmented program received 103.7 points of 150. It was clear that the ARC research was being implemented as intended and that there was a substantial difference in the nature of the services being provided in favor of the augmented condition. This fact was represented quantitatively, but qualitative differences in conditions further emphasized the distinction.

The ARC was doing a competent job. The inclusion of procedures used in the augmented condition clearly appeared to raise intervention near a level that would be considered "best practice." Overall, the site review team agreed that the augmented condition contained the procedures of choice based on available resources.

Costs of alternative interventions. During the 1987-88 academic year, cost data for each of the intervention programs were obtained using an "ingredients" approach. This approach includes resources such as direct services and administrative personnel, facilities, equipment, transportation, and materials and supplies. The estimated cost per child for each program is presented in Table 5.6. Data for the basic program includes all children enrolled in the ARC center-based program; including children in the basic and augmented programs, as well as children not enrolled in this study. The data on the basic program represents those financial resources provided by the ARC. The data for the augmented program represents the extra financial resources that were provided to those children in the three augmented classrooms, to implement the intervention described earlier.

Table 5.6
Cost Per Child Per Year for ARC (1987/88) Intervention Programs
In ARC Paraprofessional Training Study

Resource	Basic Program (N = 82)	Augmented Program (N = 22)
Administration	$ 773	$ 1,098
Salaries	5,431	5,431
Consultants	486	2,002
Capital Assets (includes depreciation of equipment and minor fixed assets)	197	197
Occupancy	341	341
Transportation	843	871
Miscellaneous	486	649
	$8,557	$10,589

The per-child cost for children in the basic program (see Table 5.6) appears high, but consideration of the facts that it is an all-day program which provides transportation and meals brings the cost figure into perspective. An additional 24% of the basic program per-child cost was needed to implement the augmented classroom program. The cost per child of the augmented program, $10,589, was just over $2,000 more than the basic program.

Ecobehavioral assessment. Another concern in regard to data collection is related to the specific effects the intervention had on teacher behavior and how differences in teacher behavior affect subject behavior. An ecobehavioral observation instrument was developed by the LSU Human Development Center staff to address these and related questions in the ARC study and was employed in the second year of intervention. Ecobehavioral measurement is based on the theory that interaction between the child and environment is continuous, reciprocal, and interdependent (Bijou & Baer, 1978). The ecobehavioral approach assesses program variables through systematic observation and measures moment-to-moment effects of the interactions between environment, teacher behavior, and student behavior (c.f., Carta & Greenwood, 1985). Data from the ecobehavioral observation allows for the examination of the types of behaviors exhibited by teachers in the two conditions and the effect of these on child behavior.

The observation system developed for this study was based on the model of ecobehavioral assessment as described by Carta and Greenwood (1985) and was modeled after the Ecobehavioral System for Complex Assessment of the Preschool Environment [ESCAPE] (Carta, Greenwood, & Atwater, 1985). The instrument, the Ecobehavioral Assessment for Infant Programs [EAIP] (Atwater, Welge, & Rider, 1988) was designed specifically for intervention programs serving children below the age of three. The EAIP accommodates the behavioral competencies of very young children with handicaps and the characteristic features of very early intervention programs.

Observation for the EAIP were conducted in April and May 1988. Sixteen children were observed in augmented classes and 15 in basic classes. This represents all children except one from each group. These missing children were absent from school when observations were scheduled. Observations occurred in all six classrooms that were involved in the study. Each classroom was staffed by two paraprofessionals (teacher and aide).

The EAIP assesses three major features of center-based early intervention programs for infants and toddlers: the program ecology, the behavior of teachers and caregivers, and the behavior of child participants. Three specific ecological variables are assessed: the format of a child's activity, the materials used in the activity, and the child's physical location during the activity. For teachers, behavioral variables include teacher direction and the quality of teachers' responses to children. For children, behavioral variables include appropriate engagement in activities, communicative behavior, and competing (or inappropriate) behavior. A brief description of EAIP variables is presented in Table 5.7 (definitions of variables can be obtained from EIRI).

All variables were recorded on a time-sampling basis as they pertained to an individual child who was the target of the observation. Data were recorded during successive 15-second intervals, each consisting of 5 seconds for observation followed by 10 seconds for recording. An observation sample began with one interval for recording ecology variables, followed by four intervals for recording behavior variables. A child's behavior and teacher behavior toward that child were recorded concurrently. The sequence (1 ecology interval, 4 behavior intervals) was repeated until 10 minutes of data had been recorded. At the end of each 10-minute sample, a new target child was observed. An average of 12 10-minute samples, distributed across several days and different classroom activities, were obtained for every child (range = 9 to 15 samples per child). For each variable (e.g., activity format), one category (e.g., snack) was selected to represent each interval.

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 19% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same category for a particular variable, averaged 85% across variables, with a range of 74% to 96%.

Table 5.7
Outline of EAIP Variables and Categories Within Variables for ARC Paraprofessional Training Study

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ECOLOGICAL VARIABLES

A. ***Activity Format***

The overall format or structure of the activity in which the teacher has placed the target child.

Snack
Structured Play
Personal Care
Transition
Manipulative Therapy
Social Play
Participant Routines
Time-Out
Individual Instruction

B. ***Materials***

Objects with which the target child is engaged or to which the child is attending.

Large motor equipment
Sensory-perceptual materials
Non-toy materials
No access to materials
Pretend play toys
Manipulatives
Books, Pictures, and audio-visuals

C. ***Location***

The physical placement of the target child

Held by adult
Chair
Crib/playpen
Floor
Table
Adaptive Seat

TEACHER BEHAVIOR VARIABLES

A. ***Teacher Direction***

Physical Direction
Environment Arrangement
Gestural Prompts/demonstration
Monitoring
Verbal Direction
Disengaged
Questions

B. ***Teacher Response***

The quality of teachers' responses to the target child.

Reprimand/criticism
Negative Feedback
Praise
Positive Feedback
Ignoring

CHILD BEHAVIOR VARIABLES

A. ***Activity Engagement***

The child's interaction with and/or attention to the materials or people that are relevant to the activity in which the teacher has placed the child.

Initiated engagement
Active engagement
Cooperation
Attention

B. ***Communicative Behavior***

Spontaneous (not prompted by the teacher)
Word(s)
Vocalization
Gesture
Body Orientation

C. ***Competing Behavior***

Behaviors that are inappropriate within the context of the child's activity and/or that could interfere with appropriate engagement and appropriate communication.

Seizure
Self-Stimulation
Self-Injurious behavior
Noncompliance
Aggressive/Destructive Behavior
Cry/Tantrum

Ecobehavioral Analysis

Comparative data for classrooms from the augmented and basic conditions are provided in Table 5.8. The percentages represent the average portion of total observation time that children in each condition spent in specific ecological contexts, received direction and response from teachers, and exhibited particular appropriate and inappropriate behaviors. To evaluate differences between conditions, two-tailed *t*-tests (df = 29) were performed on individual percentage scores. Several categories were too low in frequency to permit a meaningful comparison between conditions. Thus, categories that occurred less than 3% of the time in both conditions were eliminated from statistical analyses. To control for Type I error, *t* values were evaluated against a significance level of $p < .01$.

As illustrated in Table 5.8, teachers who had received the augmented intervention services provided more structured and varied classroom experiences than did teachers who had received only in-service instruction. When compared to those in basic classrooms, children in augmented classrooms more often participated in snack, participant routines (activities involving joint participation and turn-taking with other children), and structured play (activities in which teachers had provided specifically selected instructional and play materials). In basic classrooms, children spent over half their time in no identifiable activity. The comparable proportion of times no identifiable activity occurred was significantly lower in augmented classrooms. Despite the lack of teacher structured activities, children in basic classrooms engaged in more active manipulation of materials and more communicative behavior than did children in augmented classrooms.

Results of the ecobehavioral observations indicate that the augmented intervention did have an effect on teacher behavior as it relates to the structure of their daily activities. The higher levels of snack, participant routines, and structured play are logical based on the fact that teacher training activities were focused on

Table 5.8

Percentage of Time in Categories Observed by the Ecobehavioral Instrument for the ARC Paraprofessional Training Study

	Basic	Augmented	_t_
ECOLOGICAL CONTEXTS			
Activity Format			
Snack	11.07	26.43	12.592*
Personal Care	4.16	3.36	1.155
Manipulative Therapy	1.01	2.05	---
Participant Routines	7.78	25.77	17.740*
Individual Instruction	4.31	3.32	1.150
Structured Play	8.62	13.33	4.609*
Transition	6.71	5.09	2.025
Social Play	0.97	0.18	---
Time-Out	1.31	0.72	---
No Specified Format	54.06	19.76	25.809*
Materials			
Large Motor Equipment	8.82	8.83	0.011
Non-Toy Materials	17.88	24.88	5.907*
Pretend Play Toys	9.57	6.69	3.022
Manipulatives	16.69	15.91	0.716
Books and Audiovisual Materials	5.56	6.98	1.521
Sensory-Perceptual Toys	0.21	3.20	4.926*
Other Materials	1.35	0.395	---
No Access to Materials	9.63	19.82	6.795*
No Contact with Materials	30.29	13.32	15.512*
Location			
Held by a Teacher	0.75	0.58	---
Crib or Playpen	0.49	0	---
Seated at a Table	29.15	31.87	1.943
Adaptive Seating	6.72	14.54	4.506*
Free-Standing Chair	6.47	19.67	11.398*
On Floor	21.75	22.62	0.613
None of the Above	34.67	10.72	17.193*

(continued)

NOTE: Dashes denote those categories that were not analyzed because of extremely low frequencies.

* $p < .001$

Table 5.8 (continued)

Percentage of Time in Categories Observed by the Ecobehavioral Instrument for the ARC Paraprofessional Training Study

	Basic	Augmented	_t_
TEACHER BEHAVIOR TOWARD CHILDREN			
Direction			
Physical Direction	5.38	7.54	2.680
Gestural Prompts and Demonstration	1.71	3.56	3.104
Verbal Direction	6.65	6.04	0.836
Questions	1.85	1.59	---
Environmental Arrangement	0.01	0.12	---
Visual Monitoring	30.97	33.17	1.638
Disengaged (not attending to classroom)	0.59	0	---
Response			
Reprimand or Criticism	0.48	0.19	---
Negative Task Feedback	0.39	0.17	---
Praise	0.28	0.46	---
Positive Task Feedback	0.14	0.16	---
Ignoring Child Initiation	0.66	0.19	---
CHILD BEHAVIOR			
Activity Engagement			
Active Engagement	35.05	29.60	3.857*
Cooperation with Physical Direction	5.18	7.23	2.566
Visual Attention to Activity	28.56	39.33	8.609*
Communicative Behavior			
Verbal	6.36	1.70	5.248*
Nonverbal (vocalization, gesture, and change in body orientation)	2.94	3.27	0.613
Competing Behavior			
Seizure	0.02	0	---
Self-Injurious Behavior	0	0	---
Aggressive or Destructive Behavior	0.86	0.04	---
Crying	2.67	1.98	---
Self-Stimulation	0.61	0.31	---
Noncompliance	0.54	0.60	---

incidental teaching through developmentally appropriate activities. These activities can be made developmentally appropriate and they allow for high levels of incidental teaching (Haring & Innocenti, 1988). Unfortunately, these activity changes were not accompanied by significantly higher, at the $\underline{p} < .001$ level, rates of teacher prompting (categories of physical direction and gestural prompts and demonstration), or positive teacher responses (categories of praise and positive task feedback). These teacher behaviors are expected to occur more frequently when using incidental teaching techniques (Haring & Innocenti, 1988). Although, teacher direction categories of physical direction and gestural prompts and demonstration were significant, at $\underline{p} < .02$, .01, respectively, suggesting some effect of training on teacher behavior.

An interesting aspect of the ecobehavioral data is the finding that active engagement was significantly different between groups, in favor of the basic classroom, when the teacher training did effect classroom activities that would be expected to increase active engagement. Active engagement is considered the critical child behavior to increase to maximize child learning (Carta et al., 1988). The classroom contexts most frequently used by the teachers in augmented classrooms appears to have primarily effected child visual attending behaviors. This result may require the re-examination of some assumptions regarding the use of incidental teaching for toddler-aged children and/or the way in which others are trained in its use.

Data Collection

A variety of measures of child and family functioning were used to examine whether the interventions resulted in differences between the groups.

Battelle Developmental Inventory. All children were administered the Battelle Developmental Inventory (BDI). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. As a norm referenced measure appropriate for children from birth to age 8, the BDI served as the primary measure of child development. Test characteristics of the BDI allow valid assessment in a number of developmental domains, and the age range it spans allow for its use in longitudinal research. The BDI was selected for use in the EIRI research based upon the results of an expert panel convened to help determine appropriate measures and is used at all EIRI research sites.

Measures of family functioning. Parents of children in the study completed the following scales of family functioning: Parenting Stress Index (PSI), Family Resource Scale (FRS), and the Family Adaptability and Cohesion Evaluation Scales (FACES). These measures assess, respectively: parent stress, family resources, and functioning of the family in respect to an "ideal" family. Family functioning has been an overlooked area of early intervention research (Casto & Mastropieri, 1986), and, thus, a variety of family functioning instruments were used to detail changes that may occur given different types of early intervention services. These measures will also allow the determination of services that are more beneficial to certain types of families. These family measures and the BDI (core measures) are completed at each test session.

Early Intervention Developmental Profile (EIDP). The EIDP is based on a listing of developmental skills and provides a more comprehensive breakdown of skills by age level than is available through the BDI. With the severity of handicaps of children in this study, the EIDP may be more sensitive to child gains than the BDI and, thus, a more accurate indicator of child change.

Interactive Communication Inventory (ICI). Communication skills were a primary focus of the augmented condition, and the majority of children enrolled in the ARC exhibited language delays. The ICI assesses language development in 7 areas (e.g., morphology, phonological, etc.) and, like the EIDP, will allow a more sensitive assessment of child language skills than provided by the BDI.

Videotaped developmental goals. A videotaped sample of child developmental goals was obtained during the 1987-88 year. Videotapes have been recorded pre and post on a set of three developmental goal areas for each child. Goal areas were selected by the classroom teachers. These videotapes will be subject to a procedure similar to goal attainment scaling. A full analysis of these videotapes has not occurred. Research activities to determine the protocol to be used for scoring the tapes is being developed. A random sample of child tapes (14%) have been selected for use in these development activities. Tape segments of children are being presented to students at Utah State University in one of two sequences: (1) pre-activities then post-activities, and (2) a random mix of pre- and post-activities. A different scoring protocol has been established for each sequence. Data from this preliminary research will provide information on the viability of this activity and on preferred procedures. The intent for the final procedure is that scoring will be done by teachers experienced in early intervention but naive to this study. The use of this procedure should allow factors related to the degree of handicapping condition to be taken into account, a factor not accounted for by developmental measures. This procedure was instigated because of concerns regarding the severity of handicaps exhibited by the ARC subjects, and the potential insensitivity of normative measures with this population.

Recruitment, training, and monitoring of diagnosticians. Local test examiners were recruited from staff at the Louisiana State University (LSU) Human Development Center who were not involved with the ARC research. Examiners were kept blind to individual subject's group assignment. Examiners were certified as competent BDI administrators through procedures developed by EIRI. These procedures required a minimum of three practice administrations prior to a test session, one of which was observed and rated by the LSU site liaison or EIRI assessment coordinator. In addition, examiners sent one videotaped BDI session to the EIRI assessment coordinator for review prior to their first test session, and one each year they served as examiners.

These training procedures occurred in addition to monitoring in the form of a 10% shadow score of all test administrations by the LSU site coordinator. All test protocols were then rechecked by EIRI clerks prior to entry on computer, and data on examiners was kept. No problems in test administration or scoring have been revealed by this process with the ARC examiners. Interrater reliability has consistently produced coefficients above .85.

Examiners also handed out parent completed surveys and measures during test sessions. These measures were described and assistance was given where needed. If unusual circumstances occurred (e.g., a parent unable to read), a second examiner was brought in to assist the parent. Parents were asked not to discuss their child's classroom placement.

The BDI examiners also administered posttest complementary measures. These measures were administered at the intervention sites but not in the classrooms. At the most recent posttest (1988), an exception was made, and the Early Intervention Developmental Profile (EIDP) was administered in the classroom. Although examiners were not told which condition classrooms were in, differences may have been evident. The EIDP was the last measure administered. Shadow scoring of 10% of the complementary measures also occurred, and no problems were encountered. Examiners were trained in the administration of complementary measures prior to their use.

Pretest. Subjects involved in the study during the first year were pretested in November and December 1986. Subjects newly enrolled in the study for the second year were pretested in October and November 1987. Testing occurred at each child's respective school. The BDI was administered, and parents, mostly mothers, completed the family measures. These included those measures described earlier and the Family Support Scale (FSS) and Family Inventory of Life Events (FILE). The FSS and FILE were measures in the EIRI core battery for assessment of families. Concerns were raised by site staff regarding the number of family measures with this subject population in light of the nature of the study and intervention services. Negotiations resulted in these measures being dropped, as equivalent information was obtained through other family measures. Families were paid a $20 incentive. Parents also provided demographic information.

First posttesting. Posttesting occurred at the end of the school year during the last 3 weeks of July and the first week of August during Year 1 and in May during Year 2. Children enrolled both years received testing at both posttest occasions. Only the Year Two results are referred to as first posttest for analysis purposes. The posttest battery consisted of the core battery of tests and surveys as well as the complementary and treatment verification measures described earlier. Procedures described earlier were followed for posttest assessment. Parents were paid a $40 incentive at posttest.

Second posttesting. In 1988, when 1987 "graduated" subjects were to receive their second posttest, budget negotiations were occurring between the LSU Human Development Center (HDC) and EIRI. The result of these negotiations was that the HDC would not be involved in post-intervention follow-up activities. As this negotiation process was not resolved until late Fall 1988, combined with the preparations needed to train new examiners and locate subjects, it was decided that all subjects would receive post-intervention follow-up testing during 1989.

David Sexton, professor and chair of the Special Education Department, University of New Orleans (UNO), is currently serving as local site coordinator for follow-up activities. Graduate students and faculty at UNO have received EIRI Battelle Training and have been certified as examiners. Follow-up testing began in

May 1989 and were completed in September 1989 for all subjects who received intervention. Analysis on these data are not included in this report.

Results and Discussion

This study examined the effects of two different procedures for training paraprofessionals on child and family functioning outcome measures. One training procedure, the basic (control) condition, is low intensive involving only minimal contact between professionals and paraprofessionals. The other procedure, the augmented (experimental) condition, is high intensive and makes use of a collaborative consulting model that involves frequent and sustained training contacts between the professional and paraprofessional.

The following section will examine group comparability on pretest measures and present the effects of intervention on child and family functioning for all subjects after intervention. A subgroup analysis, based on severity of developmental delay, for children receiving one year of intervention will also be presented.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 5.2 and discussed earlier. Group differences on pretest measures are presented in Table 5.9. Subjects were comparable in all BDI domains, on the BDI total score, and for chronological age at pretest. On measures of parent and family functioning, group differences were found only on PSI measures of child related and total stress. Parents of subjects in the augmented group appear to be more stressed than parents of basic condition subjects. Families of subjects in both groups appear comparable in relation to sources of support, occurrence of major life events, and perception of the family in relation to the "ideal."

In view of the fact that comparisons were made on 16 different variables, it would not be surprising to find statistically significant differences on two of them,

Table 5.9

Comparability of Groups on Pretest Measures for ARC Paraprofessional Training Study

Variable	One Year of Intervention							
	Basic			Augmented			P Value	ES[$]
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
• Age in months at Pretest	23.7	(6.5)	32	23.0	(7.2)	32	.70	-.11
• Battelle Developmental Inventory (BDI)[*] DQs for:								
Personal Social	41.3	(28.0)	32	46.9	(22.6)	32	.56	.20
Adaptive Behavior	50.6	(28.9)	32	49.7	(23.0)	32	.81	-.03
Motor	40.3	(27.4)	32	41.9	(21.4)	32	.74	.06
Communication	50.4	(28.8)	32	44.1	(22.9)	32	.19	-.22
Cognitive	44.4	(29.5)	32	45.7	(24.6)	32	.74	.04
TOTAL	45.9	(27.3)	32	47.9	(20.9)	32	.94	.07
• Parenting Stress Index (PSI)[#]								
Child Related (range 50 to 250)	112.8	(20.9)	32	126.8	(15.0)	32	.003	-.67
Other Related (range 54 to 270)	123.3	(24.0)	32	130.4	(25.7)	32	.26	-.30
TOTAL (range 101 to 504)	236.1	(40.3)	32	257.2	(32.4)	32	.02	-.52
• Family Adaptation and Cohesion Evaluation Scales (FACES)[†]								
Adaptation (range 0 to 30)	5.4	(3.8)	32	5.2	(4.0)	32	.81	.05
Cohesion (range 0 to 26)	6.2	(5.9)	32	5.0	(4.1)	32	.32	.20
TOTAL (range 0 to 40)	9.1	(5.9)	32	8.0	(4.5)	32	.41	.19
Discrepancy (range 0 to 80)	13.5	(12.3)	32	12.4	(12.3)	31	.71	.09
• Family Resource Scale[&] (FRS) (range 30 to 150)	108.9	(15.8)	32	110.8	(20.7)	31	.67	.12
• Family Inventory of Life Events (FILE)[#] (range 0 to 71)	10.1	(6.8)	32	10.4	(6.2)	31	.84	-.04
• Family Support Scale[&] (FSS) Total Score (range 0 to 4)	1.9	(0.9)	31	2.0	(1.0)	32	.95	.11

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the Table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FSS nd FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. For the FSS, the score represents the sum of perceived support divided by the number of reported sources of support. Higher scores are considered better.

[#] The PSI and FILE analyses are based on raw scores where low scores are considered more desirable.

[$] $$ES = \frac{\overline{X}\text{ (Augmented)} - \overline{X}\text{ (Basic)}}{\text{SD (Basic)}}$$ Effect sizes for the PSI, FILE, and FACES are reversed, as low scores are preferred.

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even if the groups are completely comparable. The average effect size across all pretest measures was -.06, suggesting the groups are comparable. Assuming that families of children in the augmented group are showing greater levels of stress (effect size of -.29 on the PSI Total and FILE), this effect is balanced by greater levels of support and resources, and by functioning closer to an ideal family (effect size of .14 on FRS, FSS, FACES Total). Overall, it appears that the groups are comparable on pretest measures.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses.

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the test and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical p value for assuming statistical significance was set at 0.05. If a p value between .05 and .10 was found, combined with an effect size above 0.4, this result was considered as having functional significance.

Measures of Child Functioning

Table 5.10 presents the effects of alternate forms of intervention on measures of child functioning from the BDI, EIDP, and ICI. Effects for the measures of child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Effects for measures other than child functioning included on Table 5.10 were analyzed using an analysis of variance procedure. The results of the analyses reported in Table 5.10 demonstrate no significant effects of intervention in favor of the augmented condition as assessed by the BDI, EIDP, or ICI. The average effect size across the total from all three measures was -.07. These results suggest no differences on measures of child functioning.

Measures of Family Functioning

Table 5.11 presents the effects of alternative forms of intervention on measures of family functioning. These results suggest that the alternate forms of intervention did not have a significant effect on parent stress, family resources, or perception of family toward an "ideal." Parent and family perceptions on these measures do not change as a result of having a child in either the basic or augmented condition.

Table 5.10
Posttest Measures of Child Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

		One Year of Intervention										
		Basic				Augmented						
Variable	Covariates[a]	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	p Value	ES[$]
Average length of intervention in months	–	8.7	(3.6)		32	8.7	(3.4)		32	.00	1.0	.00
Age in months at posttest	–	32.9	(5.6)		32	32.3	(6.3)		32	.18	.68	-.11
Battelle Developmental Inventory (BDI)[*]												
Personal-Social	1,14,17	59	(29)	61	32	54	(22)	52	32	3.06	.09	-.31
Adaptive Behavior	2,14,17	42	(18)	41	32	40	(73)	41	32	.00	.91	.00
Motor	3,14,17	53	(31)	53	32	52	(24)	52	32	.13	.72	-.03
Communication	4,14,17	28	(12)	27	32	25	(10)	27	32	.00	.95	.00
Cognitive	5,14,17	20	(11)	21	32	18	(7)	17	32	3.78	.06	-.36
Total	6,14,17	204	(97)	203	32	189	(83)	189	32	1.18	.28	-.14
Early Intervention Developmental Profile (EIDP)[*]												
Gross Motor	6,14,17	45	(25)	44	32	48	(21)	49	32	1.20	.28	.20
Fine Motor	6,14,17	27	(15)	27	32	25	(11)	25	32	.59	.44	-.13
Feeding	6,14,17	21	(8)	21	32	22	(7)	22	32	.85	.36	.13
Hygiene	6,14,17	5	(3.7)	4.8	32	5	(3.4)	5.2	32	.59	.44	.11
Toileting	6,14,17	2.6	(2.8)	2.6	32	2.1	(2.1)	2.1	32	.78	.38	-.18
Cognitive	6,14,17	24	(14)	24	32	23	(9.8)	23	32	.28	.60	-.07
Self-Care	6,14,17	29	(14)	28	32	29	(11)	30	32	.40	.53	.14
Total	6,14,17	125	(65)	124	32	125	(50)	127	32	.10	.75	.05
ICS Total[*]	6,14,17	35.1	(23.0)	34.7	29	31.4	(15.2)	31.9	29	.66	.42	-.12

[*] Statistical Analysis for BDI, EDIP, and ICI scores were conducted using raw scores for each of the scales and these are presented.

[$] Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[a] Covariates: 1 = BDI personal-social; 2 = BDI adaptive; 3 = BDI motor; 4 = BDI communications; 5 = BDI cognitive; 6 = BDI total; 14 = PSI child; 17 = Both parents living at home.

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Table 5.11

Posttest Measures of Family Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

Variable	Covariate[+]	Posttest #1										ANCOVA F	P Value	ES[$]
		Basic					Augmented							
		$\overline{X}$	(SD)	Adj$\overline{X}$	%[**]	n	$\overline{X}$	(SD)	Adj$\overline{X}$	%	n			
Parent Stress Index (PSI)[#]														
Child Related	14,17	111	(22)	115	82	32	123	(18)	119	87	32	.76	.39	.18
Other Related	16,17	115	(34)	118	46	32	126	(26)	123	50	32	.87	.35	.21
Total	16,17	225	(43)	231	65	32	249	(38)	243	70	32	1.98	.16	.28
Family Resource Scale (FRS)[#]														
Total	16,19,17	111	(22)	112	35	31	119	(21)	118	40	31	1.42	.24	.27
Family Adaptation & Cohesion Evaluation (FACES)[*]														
Cohesion	18,16,17	4.0	(4.0)	4.7		29	4.5	(3.1)	4.7		31	.00	.98	.00
Adaptation	13,16,17	5.3	(3.5)	4.9		30	5.6	(3.6)	6.0		31	1.32	.26	.31
Total	20,16,17	8.0	(3.8)	7.6		30	7.7	(3.1)	8.2		31	.45	.50	.16

[$] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FACES, the nimerator for the ES is calculated as: Basic-Adjusted, as lower scores are preferred.

[#] Statistical analyses and Effect Sizes (ES) for the PSI and FRS were based on raw scores. Low raw scores are preferred on the PSI, high scores on the FRS.

[*] Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

[**] To assist with interpretation of the PSI and FRS, an approximate percentile score is reported in the table based on the covariance adjusted score. PSI percentiles are from the authors' normative sample; higher percentiles indicate greater stress. FRS percentiles are derived from the EIRI longitudinal data base.

[+] Covariates: 13 = FACE discrepancy; 14 = PSI child; 16 = PSI total; 17 = Both parents living at home; 18 = FSS total; 19 = FRS time availability scale; 20 = FACE perceived raw score.

Severity Analysis

Many subjects in this study exhibited more involved handicapping conditions and the developmental quotient of half the subjects was below 50. These factors raised some concerns regarding the possibility of differential effects of intervention based on the degree of delay exhibited by a child. These concerns were reaffirmed by a finding from the ecobehavioral analysis where less delayed subjects exhibited more active engagement and communicative behaviors. To examine this issue, subjects in each group were placed into a severe or mild handicapping condition category based on their pretest scores. A developmental quotient (DQ) was obtained by dividing the BDI total age equivalent by chronological age and then multiplying this sum by 100. Subjects with a DQ less than 60 were placed in the severe category, the others in the mild category. A group by severity of handicapping condition (2 x 2) analysis of covariance was then conducted. Covariates were those variables that were used in the earlier analyses. The results of this analysis for child and family functioning measures are presented in Table 5.12.

Child outcome. The results of this analysis by group on child outcome measures reflect the results reported in Table 5.10. No significant interaction effects were found.

Family measures. Results of this analysis by group is similar to those found in Table 5.11, no significant differences are indicated. Results of this analysis by severity of handicap also found no significant differences on the family measures. A significant interaction effect occurred on the FACES Total score. The interaction for the FACES Total has been graphed in Figure 5.1. These results suggest families of children with more severe handicaps are more positively affected by placement of their child in the basic intervention, where families of children with less severe handicaps are more positively affected by placement of their child in the augmented intervention. This finding should be viewed with caution. When completing 32 analyses, it is not surprising to find a significant difference, even when the groups are comparable.

Two Years of Intervention Analysis

The argument could be raised that one year of intervention was not sufficient for group differences to emerge. Although this argument has limited functional utility, as the majority of ARC children only receive one year of intervention, it can be explored with the 13 children in this study who received two years of intervention.

Comparability of groups. Tests were conducted to assess the comparability of groups for these 13 children on the demographic measures and pretest measures (the

Table 5.12

Results of Severity of Handicapping Condition by Group Analyses on Posttest Child and Family Functioning Measures for ARC Paraprofessional Training Study

Variable	Covariates[+]	BASIC								AUGMENTED								BY GROUP		BY SEVERE		BY GROUP BY SEVERE	
		SEVERE*				MILD				SEVERE				MILD				ANCOVA	P	ANCOVA	P	ANCOVA	P
		X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	F	value	F	value	F	value
BDI**																							
Personal-Social	1,14,17	49	(30)	63	20	77	(18)	64	12	48	(21)	50	23	69	(20)	66	9	1.22	.27	2.15	.15	2.16	.15
Adaptive Behavior	2,14,17	35	(17)	42	20	55	(13)	44	12	38	(14)	41	23	45	(7)	45	9	.04	.83	1.37	.25	.17	.69
Motor	3,14,17	40	(27)	55	20	75	(33)	57	12	46	(23)	51	23	65	(19)	63	9	.05	.83	3.22	.08	2.07	.16
Communication	4,14,17	24	(13)	27	20	36	(7)	26	12	23	(11)	26	23	31	(7)	27	9	.10	.76	.77	.38	.65	.43
Cognitive	5,14,17	16	(11)	21	20	28	(22)	22	12	17	(6)	18	23	23	(5)	21	9	2.44	.12	1.22	.28	.37	.55
Total	6,14,17	163	(93)	214	20	171	(67)	211	12	233	(49)	189	23	213	(57)	225	9	.19	.67	1.51	.27	2.54	.12
Early Intervention Developmental Profile**																							
Gross Motor	6,14,17	55	(24)	47	20	61	(17)	46	12	44	(23)	49	23	55	(13)	56	9	1.96	.17	.34	.56	1.03	.32
Fine Motor	6,14,17	21	(15)	28	20	38	(9)	29	12	22	(11)	25	23	32	(9)	30	9	.11	.74	1.51	.22	.97	.33
Feeding	6,14,17	18	(9)	22	20	27	(4)	22	12	21	(8)	23	23	25	(4)	24	9	1.22	.27	.11	.74	.47	.50
Hygiene	6,14,17	3	(2.5)	4.4	20	8.3	(2.8)	6.3	12	4.8	(3.6)	5.5	23	5.6	(2.8)	5.5	9	.06	.81	1.66	.20	2.42	.13
Toileting	6,14,17	1.4	(1.7)	2.1	20	4.8	(3.1)	3.9	12	1.8	(2.0)	2.0	23	2.8	(2.5)	2.6	9	1.30	.26	3.68	.06	1.17	.29
Cognitive	6,14,17	18	(13)	24	20	35	(7)	28	12	21	(10)	23	23	29	(5)	28	9	.06	.81	4.02	.05	.29	.59
Self-Care	6,14,17	22	(12)	28	20	40	(8)	32	12	28	(12)	30	23	33	(8)	32	9	.28	.60	1.42	.24	.10	.24
Total	6,14,17	97	(62)	128	20	174	(37)	134	12	115	(52)	127	23	151	(30)	147	9	.41	.53	1.65	.20	.65	.43
Interactive Comm. Inventory (ICI)**																							
Total	6,14,17	23	(19)	36	18	46	(22)	33	11	28	(14)	32	21	32	(14)	28	8	2.32	.13	.98	.33	.01	.93
Parent Stress Index$																							
Child Related	14,17	116	(21)	115	20	103	(22)	112	12	123	(19)	117	23	121	(16)	119	9	.98	.33	.04	.83	.30	.59
Other Related	16,17	118	(23)	115	20	110	(26)	120	12	124	(28)	123	23	133	(22)	123	9	.95	.33	1.29	.26	.02	.88
Total	16,17	233	(41)	230	20	214	(45)	232	12	246	(40)	241	23	254	(36)	245	9	1.81	.18	.14	.71	.02	.90
Family Resource Scale (FRS)**	16,19,17	108	(16)	113	19	119	(29)	112	12	120	(19)	120	23	117	(27)	117	9	1.01	.32	.06	.81	.04	.84
Family Adaptation & Cohesion Evaluation (FACES)**																							
Cohesion	16,18,17	4.9	(4.3)	4.7	19	4.9	(3.7)	4.8	12	5.3	(3.0)	5.5	23	2.4	(2.2)	2.4	8	.61	.44	2.38	.13	2.87	.10
Adaptation	16,13,17	4.3	(3.0)	3.8	19	6.8	(3.9)	6.5	12	5.9	(3.8)	6.0	23	4.6	(3.1)	5.3	8	.22	.64	1.04	.31	3.25	.08
Total	16,20,17	7.1	(4.1)	6.7	19	9.4	(2.8)	8.7	12	8.6	(3.6)	8.6	23	5.4	(3.0)	6.3	8	.10	.76	.03	.87	5.0	.03

[+] Covariates: 1 = BDI Personal Social; 2 = BDI Adaptive; 3 = BDI Motor; 4 = BDI Communication; 5 = BDI Cognitive; 6 = BDI Total; 13 = FACE Discrepancy; 14 = PSI Child; 16 = PSI Total; 17 = Both parents living at home; 18 = FSS total; 19 = FRS time availability scale; 20 = FACE perceived raw score.

* Severity was based on child developmental quotient at pretest, based on the BDI Total age equivalent. Developmental quotient (DQ) was calculated as BDI Total age equivalent divided by chronological age; this sum was then multiplied by 100. Severe children are defined as those with DQs below 60.

** Statistical analyses for the BDI, EIDP, ICI and FRS were based on raw scores and raw scores are presented.

$ Statistical analyses for the PSI were based on raw scores where low raw scores are most desirable.

** Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

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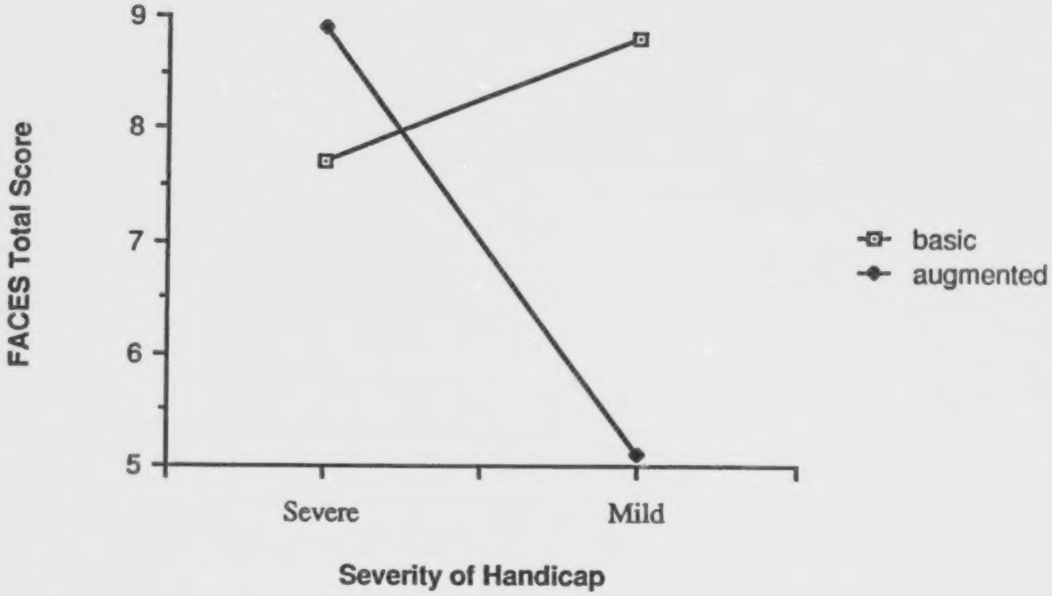

Figure 5.1. **Interaction of group by severity of handicap on FACES Total Raw Score for the ARC Paraprofessional Training Study.**

same variables presented in Tables 5.2 and 5.9 were analyzed). No differences were found on any of the demographic characteristics.

On pretest measures, the groups were comparable in all BDI domains, on the BDI Total score, and for age at pretest. Significant differences were found on two of the family measures. Parents of children in the augmented group had significantly more major life events occur to them in the past year than parents of children in the basic group as reported on the FILE ($\underline{p}$ = .01, ES = -1.96). On the FACES, a difference was found in the discrepancy score (p = .09, ES = 1.86). This score indicates parental perception of the way their family currently functions with the way their family would ideally function. Parents of children in the augmented group reported significantly less discrepancy between current and ideal family functioning. Based on the number of analyses conducted, it would not be unexpected to find a significant difference on some variables, even if groups were comparable. The average effect size across all family measures was .05. These data suggest that, overall, groups were comparable at pretest.

Child measures. Results are presented in Table 5.13. Selection of covariates was described in an earlier section and applies to these analyses. No significant effects of intervention were found in favor of the augmented group on any measures. Differences in favor of the basic group were found on the BDI Communication domain and the EIDP Gross Motor, Feeding, and Self-Care domains, as well as the EIDP Total Score.

Family measures. The effects on family functioning for children who received two years of intervention are also presented in Table 5.12 and present a very different picture from those subjects that received one year of intervention. Parents of children in the augmented group reported significantly more stress on items related to their child than did parents of children in the basic group. In addition, families of children in the basic group were found to be better balanced, especially in terms of cohesiveness, as indicated by the FACES, than families of children in the augmented group.

The potential reasons for these differences are difficult to discern. Neither the basic nor augmented group directly affected parents or families differentially. One possibility is that the greater gains of children in the basic group on skills that are salient and important to parents (i.e., communication, gross motor, feeding, and self-care) had the effect of solidifying family relations. The converse would be true for the families of children in the augmented group. Lack of progress, as expected by the parent, may have negatively affected the family. This hypothesis is only conjecture at this time, but is one that warrants further investigation, and is an issue that can be examined using the EIRI data set.

Table 5.13

Posttest Measures of Child and Family Functioning for Alternative Intervention Groups for Subjects Receiving One and Two Years of Intevention for ARC Paraprofessional Training Study

Variable	Covariates[&]	Basic					Augmented					ANCOVA		
		$\bar{X}$	(SD)	Adj. $\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	%ile	n	F	ES[Δ]	P Value
Battelle Developmental Inventory (BDI)[*]														
Personal-Social	1,7,10	64	(17)	72		7[**]	61	(22)	53		6	.79	-1.12	.40
Adaptive Behavior	2,7,10	48	(13)	45		7	43	(7)	47		6	.10	.15	.77
Motor	3,7,10	65	(19)	70		7	51	(25)	46		6	2.7	-1.26	.14
Communication	4,7,10	30	(4)	35		7	29	(15)	23		6	3.96	-3.0	.08
Cognitive	5,7,10	22	(7)	25		7	21	(4)	18		6	2.87	-1.0	.13
Total	6,7,10	229	(53)	251		7	205	(63)	182		6	3.0	-1.30	.15
Early Intervention Developmental Profile (EIDP)[*]														
Gross Motor	6,7,10	59	(8)	64		7	47	(15)	42		6	8.88	-2.75	.02
Fine Motor	6,7,10	34	(7)	36		7	31	(12)	28		6	.99	-1.14	.35
Feeding	6,7,10	25	(3)	29		7	22	(7)	18		6	10.77	-3.67	.01
Hygiene	6,7,10	6.7	(3.2)	7.4		7	5.2	(4.0)	4.4		6	1.23	-.94	.30
Toileting	6,7,10	3.6	(2.5)	3.9		7	2.8	(2.7)	2.5		6	.50	-.56	.50
Cognitive	6,7,10	28	(9)	31		7	26	(11)	23		6	1.76	-.89	.22
Self-Care	6,7,10	35	(8)	40		7	30	(12)	25		6	5.54	-1.88	.05
Total	6,7,10	156	(29)	171		7	133	(47)	118		6	5.40	-1.83	.05
ICI Total[*]	6,7,10	36	(18)	42		6	41	(20)	36		6	.11	-.33	.74
Parent Stress Index (PSI)[#]														
Child Related	11,7,10	111	(27)	103	61	7	121	(23)	128	94	6	7.8	.92	.02
Other Related	12,7,10	118	(23)	118	45	7	131	(24)	131	68	6	.67	.57	.44
Total	13,7,10	229	(48)	218	46	7	251	(44)	263	88	6	2.48	.93	.15
Family Resource Scale (FRS)[#]														
Total	17,7,10	119	(9)	119	51	7	120	(15)	120	54	6	.03	.11	.87
Family Adaptation and Cohesion Evaluation (FACES)[+]														
Cohesion	15,7,10	3.5	(2.0)	1.3		6	4.2	(3.2)	6.4		6	7.86	-1.59	.03
Adaptation	16,7,10	7.1	(4.3)	4.9		6	6.2	(4.3)	8.4		6	4.50	-.81	.07
Total	17,7,10	8.0	(4.5)	4.8		6	7.5	(5.2)	11.5		6	7.09	-1.67	.03

[*] Statistical Analysis for BDI, EDIP, and ICI scores were conducted using raw scores for each of the scales and these are presented.

[&] Covariates: 1 = BDI personal-social; 2 = BDI adaptive; 3 = BDI motor; 4 = BDI communications; 5 = BDI cognitive; 6 = BDI total; 7 = FILE total; 8 = PSI child; 9 = both parents living at home (intact) 10 = FACE discrepancy; 11 = PSI child; 12 = PSI other; 13 = PSI total; 14 = FACE total; 15 = FACE cohesion; 16 = FACE adaptation; 17 = FRS general resources.

[Δ] Effect Size (ES) is defined here as the difference between the groups (Expended minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadege 1977; and Cohen, 1977, for more general discussion of the concept of Effect Size). For the PSI and FACES, the numerator for the ES is calculated as: Basic-Adjusted, as lower scores are preferred.

[#] Statistical analyses and Effect Sizes (ES) for the PSI and FRS were based on raw scores. For the the PSI low are more desirable.

[+] Scores for each subscale of the FACES are derived from an "ideal " score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

[**] To assist with interpretation of the PSI and FRS, and approximate percentile score is reported in the table based on the covariance adjusted score. PSI percentiles are based on the authors normative sample; higher percentiles indicate greater stress. FRS percentiles are derived from the EIRI longitudinal study data base.

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Combined results. The combined results on those subjects who received two years of intervention does not provide support for the augmented intervention. Any favorable effects of two years of intervention accrue to the basic condition subjects.

Conclusions

This study investigated the effects of two different types of training interventions for paraprofessionals who worked with toddler-aged children with handicaps. The investigation examined the effect on the paraprofessionals, on the children they taught, and on the families of these children. The training interventions compared were an inservice-based, minimal contact with professionals model--the basic condition (a commonly-used training arrangement)--versus a consultative model that used frequent and regular contact with professionals focused on teaching "best-practice" intervention strategies (the curriculum sequencing model)--the augmented condition. The results of this investigation present an interesting mix that has implications for many areas of early intervention for toddler-aged handicapped children.

A logical place to begin is with the question, "Did the intervention effect the target group at which it was aimed; i.e., the teachers?" The results of the ecobehavioral analysis indicate that changes did occur. These changes clearly occurred in the way teachers structured the contexts in which learning was to occur in the classrooms, and, to a lesser degree, in the types of positive behaviors (i.e., behaviors expected to facilitate or enhance learning) they exhibited. These teacher changes were those that would be expected based on the augmented intervention.

The second question concerns the effect of the interventions on the children in the two intervention groups. Results from the Battelle Developmental Inventory, Early Intervention Developmental Profile, and Interactive Communication Inventory indicate no positive effects of the augmented intervention on the children in this group. These test data are supported by the ecobehavioral observation finding that children in the basic group more frequently engaged in behaviors that are hypothesized to result in greater skill gains.

A third question concerns the effect of the intervention on the families of children involved in the research. The intervention itself directly affected all families equally: length of daily and yearly intervention is the same in both groups, all children are bussed to classroom sites, and all parents are expected to interact with program staff at the same level (one IHP conference). Therefore, differences between groups in family functioning were not expected, and none were found. For subjects who received two years of intervention, the effects on family functioning were more positive for the basic intervention group. The differences may have been mediated by the effect of the program on the child or may be due to other reasons. This issue requires continued investigation.

Returning to the findings that the augmented intervention did positively effect teachers but not the children they taught raised two major questions.

1. Are conceptualizations of "best practice" truly based on empirically-derived practices?
2. Are these practices "best" for all children receiving early intervention (i.e., does age make a difference)?

In a recent article on "best practices," McDonnell and Hardman (1988) point out that early childhood advances are characterized by the successful development of techniques rather than replicable models. One outcome of this is that comparisons of models rarely occurs, leaving questions of what works best for whom unanswered.

In this study, techniques considered "best practice," which were taught to paraprofessional teachers, did not have the desired effect on children. These techniques may be (and appear to be) "best practice" for some children, but the parameters of these techniques have not been examined; therefore, no guiding information is available. Procedures that allow a functional analysis to match techniques to children are necessary, and this can only be done after more comparative, parametric information is obtained.

In this study, a primary distinguishing factor from much of the literature reviewed by McDonnell and Hardman (1988) is the age of the children. Little experimental work has been conducted with intervention programs that serve toddler-aged children with handicaps. Some reviews of literature suggest that intervention programs began before a child develops to a certain maturity level (i.e., before 3 years) may not be efficacious (Casto & Mastropieri, 1986; Lazar, Snipper, Royce, & Darlington, 1981). Although it has been pointed out that many studies on which these reviews were methodologically confounded (Casto, 1986), the current study suggests program structure may also be an overlooked confounding variables. Although greater structure may be "best practice" for preschool early intervention programs, it may not be best for toddler programs. Mahoney (1988) has addressed the issue of structure. More research that directly examines what "curriculum" is best for which children is needed. The current cost and child data suggest that less intensive, in terms of classroom structure, is more beneficial for most children in toddler-age intervention programs.

Overall, the results of the current study suggest that a less intensive intervention training program is preferred over a more intensive training program for paraprofessionals working with toddler-aged children with severe handicaps. This result must be considered along with other features of the child intervention program, primarily its long duration. These results do raise many questions regarding what are best practices for toddler-aged children with handicaps. Until better answers exist regarding our knowledge of "best practices," intervention programs are best advised to proceed with caution.

Future Plans

The intervention phase of this study is now complete. Research activities will continue as longitudinal, follow-up data is obtained while children progress through school. The first set of post-intervention follow-up data have been obtained. All children, except six, have currently been tested. One child is known to have moved to Connecticut; this child will be contacted and tested if possible. Attempts to find the attrited children are being made. Next of kin will be contacted. If this proves ineffective, the possibility of trying to locate these children through school districts will be explored.

In addition to the data collected at posttest, information from the child's teacher will be obtained. At posttest, parents provided information on the child's school placement and signed a consent form for contacting teachers. Data on specific class placements, therapies received, and functioning will be obtained.

For the 1990 posttests, David Sexton will remain our site liaison and coordinate local testing. Dr. Sexton's staff at the University of New Orleans have done an exemplary job in finding and assessing children.

The information from these longitudinal posttests should provide valuable information. It is possible that the effects of the intervention may come in the form of more appropriate school survival behaviors. Such behaviors would better allow children to function in classroom environments. The effects of such an outcome would be that children demonstrate better achievement and that special class placements may be reduced. This data will only become available as the children progress through school. Longitudinal data will help solve questions of efficacy that cannot be addressed by developmental measures administered over a brief period of a person's life.

JORDAN SCHOOL DISTRICT

Project #6

COMPARISON: Mildly to Severely Handicapped Children--Participation in a 3-day-per-week, center-based preschool program versus participation in an enhanced 5-day-per-week, center-based preschool program.

SITE COORDINATOR: Chris Giacovelli, Early Intervention Program Coordinator, Jordan School District

EIRI COORDINATOR: Mark Innocenti

LOCATION: Midvale, Utah

DATE OF REPORT: 10-9-89

Rationale for the Study

Limited evidence exists in the early intervention literature to guide program decisions concerning the relative effectiveness of various intensities of program efforts (Casto & Mastropieri, 1986; White & Casto, 1985). The frequency and intensity of services in early intervention programs varies widely, based on factors such as philosophical orientation and professional judgement of child needs. With the passage of the federal mandate to provide services to all preschool-aged children with handicaps, P.L. 99-457, the intensities of programs may change to reflect the effect of more children in programs and related funding and personnel issues. One result may be that programs will decrease their intensity in an attempt to serve more children with the same level of funding. Conversely, this legislation may increase the number of individuals who advocate in favor of increased intervention for young children with handicaps. This could generate support for more assistance to such children that includes greater program intensity.

Decisions that can potentially affect the lives of children and their families, such as the intensity of a program, must be made using a data base of the effects and costs of programs of varying intensity rather than be made according to bureaucratic needs or well-meant lobbying efforts. This study will help provide information for this data base by comparing two common intensity levels of intervention services for preschool-aged children with handicaps.

Review of Related Research

Although treatment intensity may be an important variable for early intervention programs, little systematic research has occurred in regard to intensity (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; White & Casto, 1985). The field of early intervention commonly holds the belief that more is better (Casto & Mastropieri, 1986). This belief is common to our culture in many areas and may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986).

Five studies have been identified that directly examined the question of intensity in early intervention (Blank & Solomon, 1968; Burkett, 1982; Jago, Jago, & Hart, 1984; Levenstien, 1970; Sandow, Clarke, Cox, & Stewart, 1981). Only two of these used children with handicaps as subjects (Jago et al., 1984; Sandow et al., 1981). Three studies have comparison groups confounded by different interventions (Black & Soloman, 1968; Levenstein, 1970; Jago et al., 1984).

The results of these studies are equivocal. Sandow et al. (1981) found children with handicaps made better progress if home visits were separated by 8-week intervals rather than 2-week intervals. Burkett (1982) reported no differences between children who received home visits once or twice per week. Jago et al. (1984) studied language development and compared seven hours per week of intervention versus four hours and one hour per week. More hours of intervention proved better for language development, but these results are confounded by different intervention approaches in each of the three intensities. The finding from these intensity studies makes clear the need for new research studies which are methodologically sound, which directly address the question of program intensity, and which systematically vary intensity parameters.

The need for methodologically sound studies directly examining intensity parameters, where comparison groups are not confounded by different interventions, is further stressed by analyses conducted by EIRI. All articles on early intervention compiled by EIRI for use in various meta-analyses were examined for factors related to intensity. These factors were: total hours of intervention, hours per week of intervention, and duration of intervention in weeks. All studies from which these factors could be gleaned were taken, rated according to methodological quality (based on threats to internal validity), and effect sizes were obtained from the results presented. Intensity factors were not under examination (i.e., an independent variable) in the majority of this research, but information was presented that allowed intensity information to be obtained. These data are presented in Table 6.1. Only findings from studies that used children with handicaps as subjects are presented. The data in this table do not support the suggestion that "more is better."

This study directly examined one aspect of the question of program intensity. A comparison of a 3-day versus a 5-day-per-week early intervention preschool program may be of particular importance, as both represent common program intensities, and study results could affect personnel and funding issues. Impact of these different program intensities on parents and families, as well as their child, was also examined. Parent and family functioning have not received sufficient investigation in previous early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Impacts on family functioning may translate into immediate and long-term changes that can, positively or negatively, affect the child (Bronfenbrenner, 1979; Dunst, 1986).

Table 6.1

Average Effect Size for Different Intensity Factors From Studies Examining Early Intervention on Children with Handicaps

	Quality of Studies[*]			
	Good	Fair	Poor	Total
Total Hours of Intervention				
< 50	.78 (4 [2])[+]	1.01 (12 [3])	.89 (18 [6])	.92 (34 [10])
50 - 249	—[^]	.08 (3 [1])	1.20 (19 [5])	1.05 (22 [6])
250 - 499	—	.54 (5 [2])	.65 (13 [8])	.62 (18 [8])
500 - 749	.66 (2 [1])	3.31 (1 [1])	.41 (21 [4])	.54 (24 [6])
750 - 999	—	—	1.16 (5 [3])	1.16 (5 [3])
1000 - 1999	.52 (2 [1])	.66 (8 [2])	.59 (7 [3])	.62 (17 [5])
≥ 2000	—	.69 (2 [1])	1.32 (6 [2])	1.16 (8 [2])
Hours of Intervention Per Week				
< 2	.78 (4 [2])	1.34 (1 [1])	1.17 (11 [4])	1.08 (16 [7])
2 - 4.9	—	.89 (16 [2])	1.03 (31 [7])	.98 (47 [7])
5 - 9.9	—	—	.53 (15 [5])	.53 (15 [5])
10 - 12.9	—	1.19 (4 [2])	.71 (11 [9])	.83 (15 [10])
13 - 19.9	.84 (6 [2])	.30 (5 [2])	.44 (22 [4])	.49 (33 [8])
20 - 39.9	.52 (2 [2])	.70 (4 [1])	.86 (5 [3])	.74 (11 [5])
≥ 40	—	—	—	—
Duration of Intervention (Weeks)				
≤ 12	.39 (8 [3])	1.44 (7 [3])	.83 (25 [10])	.85 (40 [15])
13 - 25	.13 (2 [1])	.55 (28 [4])	.83 (41 [15])	.70 (71 [19])
26 - 38	—	.57 (23 [8])	.71 (81 [27])	.68 (104 [33])
39 - 51	.65 (11 [2])	.70 (8 [2])	.96 (40 [23])	.87 (59 [26])
52 - 77	—	.64 (8 [3])	1.00 (24 [11])	.91 (32 [14])
78 - 103	—	.69 (2 [1])	.90 (13 [6])	.87 (15 [6])
≥ 104	.10 (6 [1])	.01 (7 [1])	.49 (11 [4])	.26 (24 [5])

NOTES:

[*] Based on threats to internal validity

[+] (# of Effect Sizes [# of studies])

[^] No data for cell

Overview of Study

This study contrasted two intensities of preschool intervention services. Multiple variations distinguish the two program intensities. First, children in one group received 5-day-per-week, 2-hour-per-day preschool intervention services in classrooms established to provide appropriate, child-centered services for children with handicaps (more intensive group). Children in the other group received 3-day-per-week, 2-hour-per-day preschool intervention services in the same classroom format (less intensive group). Second, more intensive condition classrooms maintained a 3:1 child/teacher ratio while a 5:1 child/teacher ratio existed for the less intensive condition classrooms. A third intensity program variation existed in that more intensive condition classrooms were provided with increased availability of communication and motor therapists. In practice, this increased therapy time resulted in the presence of a speech and language therapist in more intensive condition classrooms each day they were in session, where the speech and language therapists were available on an every-other-day basis for the less intensive classroom condition. Differences in program efficacy were evaluated by assessing child and family outcomes, and by obtaining cost data.

Method

This study was conducted in conjunction with the early intervention program of the Jordan School District. The Jordan School District has a history of active involvement in early intervention. Although prior to the 1987/88 academic year early intervention services had been funded by the Utah Division of Social Service, the intervention services were housed in a school in the Jordan District. With the passage of P.L. 99-457 and State of Utah mandates, the district has taken over the financial and administrative responsibility of early intervention for preschoolers with handicaps. This has resulted in the district expanding early intervention classrooms into neighborhood schools while retaining experienced staff. The Jordan District currently maintains early intervention classrooms at three schools. The district offers a variety of intervention options that range from home intervention to various classroom mainstream options, to placement in neighborhood day care centers.

The early intervention program previously provided 5-day-per-week, 2-1/2 hour-per-day classroom-based intervention services to a limited number of qualified children. Children who met both age and Utah State Office of Education developmental criteria, as explained in the Recruitment section below, were placed on a waiting list, and classroom slots were filled on a first-come basis. With the transition of preschool services to school district control, the school district will be serving all eligible preschoolers and providing transportation. These factors resulted in a change in the service structure of the preschool program to a 3-day-per-week, 2-hour-per-day program.

This change in program intensity raised concerns from preschool providers, school administrators, and parents of handicapped children. In conjunction with Early Intervention Research Institute (EIRI) support, the Jordan School District received research funds from the Utah State Office of Education to examine the question of program intensity. The specific comparison investigated was established through negotiations with all participating agencies.

Subjects. Subjects for this study came from four classrooms located at two schools (two classrooms/school). All subjects were recruited for this study at the beginning of the 1988-89 school year. Fifty-three children (28 less intensive, 25 more intensive) between 36 and 62 months of age (mean = 50 months) participated in the study. Sixteen children in the less intensive group were male, and 8 males were in the more intensive group. The age equivalent for the children, based on the total score of the Battelle Developmental Inventory (BDI) ranged from 16 to 46 months (mean

= 30 months). The majority of children were mild to moderately handicapped. Using a developmental quotient (DQ) calculated by dividing the BDI total age equivalent by chronological age and then multiplying by 100, 65% of children had DQs of 65 or below; no child had a DQ lower than 40.

Recruitment. The criteria for acceptance into the early intervention program was that adopted by the Utah State Office of Education. This criteria states that a preschool-aged child can receive services as a child with handicaps if they demonstrate a delay, from the norm, of -1.5 or greater standard deviation in three developmental areas, of -2.0 or greater standard deviation in two developmental areas, or a -2.5 or greater standard deviation in one developmental area. Multiple assessments and evaluators were used in determining eligibility. Eligibility was determined by the school district.

All parents of children identified as handicapped at the schools where the classrooms were located were considered for possible placement in this study. Parents were either verbally informed or sent a letter regarding the study. Parents were then given an informed consent form to read and to indicate their agreement or refusal to participate. The site contact was available to answer parent questions and concerns. Approximately 5% of parents refused participation. The majority of these refusals were from parents of younger children who desired the less intensive program.

Study recruitment activities were halted at the end of September 1988 to allow the district to meet additional placement demands.

Assignment to groups. Subjects attended one of two schools dependent on address. In each school, one of two classrooms was established as a more intensive classroom. Two teachers, one at each school, conducted both a less and more intensive classroom. Time of day services were delivered (morning or afternoon) was counterbalanced across schools.

As children were identified, the site contact sent information on the child with a rating of degree of handicap (mild, moderate, severe) based on the initial district assessment. This information was used to create a school by severity matrix (2 x 3). Subjects were placed in their respective placements in the matrix. For subjects in each cell, there were four possible sequences of assignment. For example, if a = Group 1 and b = Group 2, a sequence may be ABAB; three other permutations existed. A die was cast for the first child in a cell, and her assignment determined the sequence for the next three children in that cell. This process was repeated for each cell of the matrix as the first child in a cell was identified.

Attrition. Fifty-three subjects were recruited to participate in this study at the beginning of the 1988-89 school year. To date none of the subjects have been lost to the study. Posttest data were obtained for all 53 subjects and their parents.

Demographic characteristics. The subject pool for this study is complete. Funds provided by the Utah State Office of Education were for only a single year. The demographic characteristics of the population sample in this study approaches what many consider the "typical" American family (see Table 6.2). Parents had slightly more than a high school education and were in their early 30s. In 92% of the families, the parents of the child were married and living together, and the mother was the primary provider of child care (96%); families had an average of four children, including the child with handicaps. Fathers worked a 40-hour week in either blue collar or technical/managerial positions; mothers did not work or held part-time jobs. The average family income was $30,000. All the families spoke English as their primary language and the majority (94%) were Caucasian.

Demographic differences between the less and more intensive subjects can be evaluated using the p-values and effect sizes given in Table 6.2. Significant p-values occur, at $p \leq .05$, for years of education for the mother, and number of siblings. Effect sizes greater than .50 occur for years of education for mother,

Table 6.2

Comparison of Groups on Demographic Characteristics for Jordan Intensity Study

Variable	Less Intensive			More Intensive			p Value	ES[$]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age of child in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Age of mother in years at pretest[+]	32.5	4.5	28	32.6	6.6	24	.95	.02
• Age of father in years at pretest[+]	35.0	4.2	28	34.9	6.0	24	.68	-.02
• Percent male[*] [+]	43		28	68		25	.07	.51
• Years of education for mother	12.7	1.9	28	14.2	1.9	25	.006	.79
• Years of education for father	13.8	1.8	26	14.3	2.5	24	.37	.28
• Percent with both parents living at home	100		28	84		25	.25	-.32
• Percent of children who are Caucasian[*]	96		28	92		24	.47	-.20
• Hours per week mother employed[+]	8.3	14.8	28	17.0	20.4	25	.08	.59
• Hours per week father employed[+]	42.3	17.9	28	38.6	16.6	22	.45	.21
• Percent of mothers employed as technical managerial or above[*]	7.0		28	21.0		24	.16	.40
• Percent of fathers employed as technical managerial or above[*]	36.0		28	12.2		23	.25	-.33
• Total household income^	$26,821	$8,572	28	$34,380	$23,512	25	.11	.88
• Percent with mother as primary caregiver[*]	100		26	92		26	.50	-.19
• Percent of families using daycare on a daily basis[*] [+]	32		28	48		25	.25	.32
• Number of siblings[+]	3.1	1.9	28	2.0	1.5	25	.02	.58
• Percent with English as primary language	100		28	100		25	1.0	.00

NOTES: [*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[+] Absolute values of the ES are reported.

[$] $ES = \dfrac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{SD\text{ (less)}}$

hours per week mother is employed, total household income, and number of siblings. The more intensive subjects had more educated mothers who worked more each week than the less intensive subjects. The more intensive group also had a higher percent of children in daycare than the less intensive group. The number of siblings in families receiving the less intensive treatment was higher than in the more intensive intervention families.

All of these characteristics on which demographic differences were found are complementary. More educated mothers could be expected to work more as their earnings in jobs outside the home would, on average, be higher. Families with two parents who work also could be expected to have a higher mean income than families where only the father is employed. Families where the mother is employed outside the home more hours use daycare more than families where the mother works only in the home or fewer hours outside the home. Finally, the number of siblings is higher for the less intensive group who use day care less and have relatively less educated mothers. It has been shown that, on average, more educated parents tend to have fewer children. More siblings raises the cost of using daycare and lowers the benefits from the mother working outside the home. Logically, these differences between the demographic characteristics of the more and less intensive subjects and their families are interconnected.

Intervention Programs

The early intervention program of the Jordan School District was mandated to provide services to all handicapped children, ages 3 to 5 years, who resided within district boundaries. The majority of these children were served in two district schools that also served as elementary schools for nonhandicapped children. Other service options were possible (home services, self-contained school placement, services in a daycare center) and were dictated by child needs. In order to study the program intensity question, classrooms within the two most populous schools (Altaview and Columbia) were selected for research involvement. Children in both the less and more intensive programs were located at each school.

Where the question of importance in this study was program intensity, it was critical that other intervention factors be held as constant as possible. At each school, teachers had morning and afternoon sessions. Two teachers were involved in this study (one per school), and each taught a less and more intensive classroom.

At one school, the less intensive class was a morning class, at the other an afternoon class. This arrangement helped control for differences resulting from factors other than intensity.

One difference in the two schools was that one of the schools (one less and one more intensive condition classroom) utilized a reverse mainstreaming arrangement to provide services. In this school (Columbia), regardless of condition, the classrooms were composed of 50% children without handicaps three days per week. The classrooms at the other school, although not similarly mainstreamed, attempted to provide integrated services with children in the kindergarten and first grade classrooms at that school. The frequency and nature of these contacts varied considerably at this school.

Children were initially assessed for early intervention placement by a transdisciplinary team of professionals using norm-referenced assessment instruments. These assessment protocols were then forwarded to the teacher for eligible children; receipt of further assessment for speech/language or motor therapy was based on this evaluation.

Once enrolled in the program, the child received a criterion-referenced assessment by the teacher. If determined appropriate at evaluation, or if suggested by the teacher, the therapists that worked with that teacher and classroom provided further area specific assessment. Information from all these sources was then combined at a meeting, in which the parent participated, to develop an Individual Education Plan (IEP) for the child. The IEP then dictated the specific nature of intervention services for that child.

Each classroom consisted of approximately 15 children. The majority of these children were in this study, but children who were not in the intensity comparison could also have been in one of the less intensive classrooms. Each classroom was staffed by one certified teacher who had access to paraprofessional aides, communication therapists, physical and occupational therapists, and a behavior specialist. Access to aides and communication therapists varied by condition and will be described below. Child need (as per the IEP) dictated contact with motor therapists and the behavior specialists, and this was equally distributed across conditions.

Teachers were free to select curricula of their choice, and classroom activities were drawn from different curricula. The primary curriculum for all classrooms can be described as a theme-based, developmentally appropriate one focused on teaching skills embedded in the daily activities. Both the teachers and communication therapists used this approach which focused on naturalistic teaching (c.f., Haring & Innocenti, 1988).

The daily organization of the classrooms was similar, regardless of experimental condition. The teacher established a number of activities that the children alternated through during the day. These activities were either directed by the aides or the teacher. Children rotated through these activities in small groups. Generally, teachers selected a number of themes that were emphasized during a school week. For example, the color green, the shape of a square, and the concept under were weekly themes. Large group activities, such as singing and calendar, were scheduled between other activities. Children were provided a snack activity each day. Children in need of more individualized instruction, as dictated by child need, were pulled from other activities for individual or smaller (2-3 children) group instruction. Individualized instructional activities were usually conducted by the teacher.

Evaluation of child IEP objectives was built into the IEP. Data on objectives were collected daily, weekly, monthly, or bi-annually, dependent on the objective. Specific criteria were set for each objective to guide evaluative activities.

Less intensive intervention program. This program consisted of a 3-day per week, 2-hour-per-day intervention service. The teacher:child ratio in the classroom was 1:5, resulting in each classroom being staffed by a teacher and two paraprofessional aides. Communication therapy was provided primarily through a consultation model where classroom staff took primary responsibility for goals and implemented activities as appropriate throughout the school day. The communication therapist was in the classroom approximately every other school day. Some children received individualized therapy from the therapist on these days. In contrast to the more intensive intervention program there was no group communication therapy activity conducted in the less intensive intervention program.

More intensive intervention program. Children in this group received 5-day-per-week, 2-hour-per-day intervention services. The teacher:child ratio in this class was enhanced from the standard program and consisted of a 1:3 ratio; one teacher and four paraprofessional aides per classroom. Communication therapy was delivered primarily through a consultation model, but the therapist was allowed more time to work with teachers. The communication therapist was in these classrooms every school day. The communication therapist, in addition to consultation and individual therapy, conducted a large group communication activity and conducted snack-time activities such that naturalistic language teaching interventions were included. Communication therapy occurred more often for the more intensive group and the large group activity was undertaken only in the more intensive group.

Treatment Verification

A number of procedures were implemented to verify that the interventions were being implemented as intended. Table 6.3 presents some of these data. One method to verify that treatment was received was through child attendance data. Attendance problems in an intensity study could significantly affect research conclusions.

Daily attendance records were kept by teachers, and these were forwarded to EIRI monthly. Regular attendance by subjects in both intensity groups is indicated.

Table 6.3
Treatment Verification data for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
• General health of child[&]	2.0	0.6	28	2.0	0.6	23	.64	.00
• Percent child attendance	90.0	9.1	28	92.5	5.5	25	.22	27
• Parent satisfaction[^]	23.1	4.5	28	24.8	2.9	23	.11	37
Staff working with child	3.8	0.5	28	3.8	0.4	24	1.00	
Ability to communicate w/staff	3.2	0.8	28	3.5	0.6	24	.17	
Program goals/activities for child	3.5	0.6	28	3.6	0.6	24	.35	
Participation in child's program	3.0	0.9	28	3.3	0.8	24	.31	
Services available for child	3.2	0.9	28	3.5	0.6	23	.17	
Child's progress	3.2	0.9	28	3.7	0.6	24	.04	
Child's program	3.3	0.8	28	3.6	0.6	24	.05	
• Teacher rating of parents[#]	6.5	1.9	28	6.8	1.8	25	.61	.16
• Hours of speech therapy and PT/OT[*]	11.56	31.06	27	7.96	22.30	24	.64	-.12
• Hours of Daycare[*]	145.9	396.4	27	237.9	506.5	24	.47	23

NOTES:

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[^] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program. Each question is scored from 1 to 4. Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

In addition to attendance, health data regarding the child was important. If the child was attending but in poor health, results may be compromised. Parents completed a health questionnaire at posttest. Questions regarding a variety of health issues were asked. No differences between groups were found on any of these health measures. General health data are presented in Table 6.3.

In a study such as this, it is possible that the parents of children in the less intensive group were supplementing their child's education with private therapies or instruction. Questions were asked at posttest to examine this issue, and parents reported involvement in these supplemental activities. Supplemental hours of speech therapy, motor therapy, and daycare are reported in Table 6.3. No significant differences were found on the supplemental activities.

Other areas also relate to treatment verification. To determine if teachers perceived differences in the skill levels of parents, they were asked to rate each parent regarding parent support of their child, knowledge of the intervention process and their child's development, and attendance at required activities. No differences were found between the parents in the two groups on any of these measures.

Teachers and other support staff were evaluated by their supervisor (the site contact) regarding their teaching techniques. An evaluation criteria developed by EIRI was used. Teachers and communication therapists at both schools were rated as being in the upper 25% of professionals that their supervisor had worked with. The respective ratings, based on a 30-point scale, of the teacher and communication therapist were: 30 and 30 for one school; 24 and 28 at the other school.

Another aspect of treatment verification was parent satisfaction with the program. Parent satisfaction was assessed through a seven-question scale completed at posttest. The results of this questionnaire are presented in Table 6.3. No group differences were found except on those questions assessing satisfaction with child progress and the general program. Parents in the more intensive group were more satisfied with both the progress their child had made, and the program in general. It should be noted that average parent satisfaction in all areas addressed represents high levels of satisfaction. Differences occur within a narrow boundary of positive satisfaction.

Site review. A major source of treatment verification information was a site review conducted by the site coordinator. The purposes of this review were to (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance. Purpose (a) and (b) were relevant to treatment verification.

A site review was conducted on April 11, 1989. The site review was conducted by a team consisting of: (a) the Jordan site coordinator; (b) the site contact, Chris Giacovelli; (c) John Killoran, Preschool Specialist for the Utah State Office of Education; and (d) Jeannette Misaka, Professor of Special Education at the University of Utah. The site review was structured by the EIRI developed Treatment Verification Guide. (A copy of the site review report and treatment verification guide can be obtained from EIRI.)

The site review findings indicated that the Jordan School District Early Intervention Program was delivering appropriate, quality intervention services. The variables that distinguished the different intensities of the programs were being fully implemented. The less and more intensive classrooms were clearly distinct with respect to student teacher ratios, number of days per week the intervention occurred, and frequency of speech and language therapy. The staff of the Jordan Preschool were qualified, enthusiastic professionals whose goal was to provide quality services to preschool-aged children with handicaps. Classroom teachers were commended on their use of developmentally appropriate classroom activities and their use of naturalistic teaching strategies. The program was competently administered and had in place a well-developed procedures manual. The program-developed transition procedures for information transfer were excellent. Critical comments were raised regarding: daily lesson plans, data collection, IEP development, assessment for program entrance, and training for aides. Comments made were minor and primarily provided suggestions for improvement. No threats to the validity of the research study were found.

__Ecobehavioral assessment__. A final major source of treatment verification was the assessment of the ecobehavioral differences between classrooms. A concern with this intervention was whether classroom contexts and teacher behaviors varied for classrooms of different intensity. It is possible that time differences (hours/week) may not result in actual program intensity differences. For example, Carta et al. (1988) examined preschool programs and found two that operated for different lengths of time, but where the intensity was equivalent. In order to account for possibilities such as this, and to examine program differences that are related to intensity, an ecobehavioral observation instrument was used. Ecobehavioral observation assesses program variables through systematic observation and measures moment-to-moment effects of the interaction between environment (classroom contexts), teacher behavior, and student behavior (c.f., Carta et al., 1988). The Ecobehavioral System for Complex Assessment of the Preschool Environment (ESCAPE; Carta, Greenwood, & Atwater, 1986) was used for this observational assessment.

The ESCAPE was designed for use in preschool environments that serve students with handicaps. The ESCAPE assesses three major features of preschool early intervention programs: (1) the program ecology, (2) the behavior of teachers, and (3) the behavior of child participants. These three major categories are subdivided into 12 subcategories (see Table 6.4). All variables are recorded on a 15-second momentary time-sampling system where all categories are scored over a one-minute period. Each subcategory is examined and scored within a 15-second time period.

ESCAPE observations were conducted in April, 1989. Each child was observed for three 10-minute samples, distributed across different days and time periods. Observations were conducted on all children in all classrooms. The only exception was one more intensive intervention subject who left school before observations were conducted. (This child was posttested.)

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 25% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same

Table 6.4

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

Ecology Variables

A.	Designated Activity	The overall format on structure of the activity in which the teacher has placed the target child.	Snack Fine Motor Story Language Programming Play Music/Dance/Recitation Self-Care Transition Clean-up Gross Motor Preacademics Class Business Time Out
B.	Activity Initiator	The person who selected the activity in which the target child was engaged.	Teacher Child No one
C.	Materials	Objects with which the target child is engaged or attending to	Large Motor Equipment Manipulatives Bathroom Art/Writing Story Books None Instructional Audio-Visual Other Pretend Play Toys Food or Food Preparation
D.	Location	The physical placement of the child.	On Floor In Line At Table Undefined In Chair On Equipment
E.	Grouping		Solitary Small group One teacher with one student Large group
F.	Composition	Mix of handicapped and nonhandicapped student within a group.	All handicapped Majority handicapped Equal None Majority nonhandicapped

Teacher Variables

G.	Teacher Definition	Primary adult with whom the target child's interacting.	Teacher Ancillary Staff Aide Substitute Teacher Student Teacher No Staff Volunteer
H.	Teacher Behaviors		Physical Assisting Prompting Gesturing/Signing Verbal Instruction Approval Reading Aloud/Singing/Recitation Disapproval Discussion Verbal No Response
I.	Teacher Focus	The direction of the behavior of the coded adult.	Target child only Target child and others No one Other than target child

Student Variables

J.	Target Behaviors	Behaviors that indicate student attention, engagement, and for participation.	Academic Work Gross Motor Behaviors Transition Pretending Singing/Reciting/Dancing Attention None Manipulating Self-care

(continued)

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Table 6.4 (continued)

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

K.	Competing Behaviors			
	Competing behaviors are those which are commonly considered to be unacceptable.			
	Acting-out	Off-task	Self-stimulation	None
L.	Verbal Behavior			
	Verbal or signed expression.			
	Talk to Teacher	Talk to Peer	Undirected	No Talk

category for a particular variable, averaged 95% across variables, with a range from 86 to 100%.

Results from the ecobehavioral observation are presented in Table 6.5. This table presents mean percentages of time that each variable was observed and analyses conducted on these variables. In addition, engagement variables are presented. Engagement values are determined based on a child's behavior across all student behavior categories during a single interval. Appropriate engagement is hypothesized to be the primary behavior contributing to child development (Carta et al., 1988).

These results should be interpreted conservatively. Multiple t-tests were conducted to obtain comparative data and may result in findings of significance, even when the groups are comparable. A difference that emerges is that the less intensive classrooms more often used preacademic activities for instructional purposes. The finding from the designated activity category is supported by results from the materials category, and student target behaviors category. This finding does not in and of itself suggest more intense formats in the less intensive group, only that a clear preference for one format emerged.

Table 6.5

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^{a}
• Designated Activity								
Snack	5.2	10.5	28	6.3	10.4	24	.70	.10
Play	5.1	13.7	28	7.5	11.7	24	.51	.18
Transition	18.9	11.7	28	18.9	13.2	24	1.0	0
Preacademics	22.6	17.5	28	7.3	10.5	24	.00	-.87
Fine Motor	12.9	14.7	28	20.1	22.9	24	.19	.49
Music/Dance/Recitation	6.3	10.2	28	9.2	13.3	24	.39	.28
Clean-up	1.8	3.6	28	2.5	3.8	24	.49	.19
Class Business	13.3	16.1	28	11.9	13.7	24	.74	-.09
Story	3.9	9.6	28	6.1	12.2	24	.47	.23
Self Care	.2	.8	28	1.9	4.4	24	.08	2.13
Gross Motor Programs	9.1	13.2	28	5.3	8.6	24	.21	-.29
Time Out	.5	2.5	28	1.5	6.7	24	.48	.40
Language Programming	.0	–	28	1.3	6.1	24	.01	.72
• Activity Initiator								
Teacher	94.4	12.7	28	92.2	10.3	24	.50	-.17
Child	5.6	12.7	28	7.5	10.1	24	.55	.15
• Materials								
None	31.9	15.9	28	27.8	15.4	24	.36	-.26
Food/Food Preparation Materials	6.5	12.3	28	7.6	11.0	24	.75	.09
Instructional Materials	21.6	18.4	28	5.7	10.2	24	.00	-.86
Manipulatives	7.5	11.5	28	19.8	22.5	24	.02	1.07
Art/Writing Materials	5.0	10.2	28	.7	2.7	24	.04	-.42
Pretend Play Toys	2.6	7.1	28	4.0	7.4	24	.50	.20
Large Motor Equipment	8.4	13.9	28	6.0	10.5	24	.49	-.17
Story Books	3.9	9.6	28	7.3	13.0	24	.29	.35
Other Materials	12.6	15.3	28	17.6	15.0	24	.24	.33
• Location								
At Tables	38.5	27.9	28	41.1	25.9	24	.73	.09
On Floor	17.7	16.5	28	22.0	24.8	24	.48	.26
Undefined Location	7.6	7.9	28	11.8	9.2	24	.08	.53
On Equipment	16.3	27.4	28	6.1	13.7	24	.09	-.37
In Line	1.6	3.4	28	2.8	4.8	24	.32	.35
In Chairs	18.1	20.0	28	14.6	24.1	24	.58	-.18
• Grouping								
Small Group	24.8	26.4	28	38.6	24.7	24	.06	.52
Large Group	71.0	27.1	28	52.8	24.8	24	.02	-.67
1 Teacher w/ 1 Student	1.5	3.7	28	2.7	8.0	24	.51	.32
Solitary	2.7	5.0	28	4.1	6.0	24	.36	.28
• Composition								
All Handicapped	49.8	46.9	28	75.4	23.6	24	.02	.55
None	4.3	6.0	28	11.3	21.0	24	.13	1.17
Majority Handicapped	10.7	16.1	28	2.6	7.0	24	.02	-.50
Majority Nonhandicapped	29.9	34.0	28	8.7	13.3	24	.00	-.62
Equal	4.5	8.8	28	.5	2.1	24	.43	-.45
• Teacher Definitions								
Aide/Paraprofessional	67.5	26.3	28	61.5	27.2	24	.43	-.23
Teacher	17.6	21.3	28	11.9	19.4	24	.32	-.27
Ancillary Staff	1.0	3.7	28	1.5	6.7	24	.73	.14
Volunteer	10.8	12.7	28	24.2	27.1	24	.03	1.06
• Teacher Behavior								
Physical Assisting	5.8	6.2	28	4.2	4.8	24	.31	-.26
Gesturing/Signing	1.0	2.3	28	.4	1.0	24	.22	-.26
Approval	4.7	4.0	28	2.7	3.0	24	.05	-.50
Disapproval	2.7	3.1	28	4.9	3.6	24	.02	.71
Verbal Prompting	13.5	7.8	28	12.0	6.2	24	.43	-.19
Verbal Instruction	16.9	7.9	28	14.3	7.1	24	.21	-.33
Reading/Aloud/Signing/Reciting	4.9	7.9	28	5.0	5.6	24	.97	.01
Discussion	6.6	5.2	28	4.8	6.1	24	.25	-.35
No Response	43.4	11.5	28	50.1	12.7	24	.05	.58

(continued)

Table 6.5 (continued)

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[a]
● Teacher Focus								
No One	43.4	11.5	28	49.4	13.0	24	.08	.52
Other Than Target Child	28.0	8.0	28	23.5	11.5	24	.10	-.56
Target Child and Others	17.5	11.3	28	15.0	8.9	24	.39	-.22
Target Child Only	10.5	7.5	28	10.6	9.5	24	.97	.01
● Target Behaviors								
Academic Work	20.2	16.4	28	6.5	11.2	24	.00	-.84
Pretending	1.8	6.2	28	3.6	6.7	24	.32	.29
Manipulating	12.4	14.2	28	20.5	22.5	24	.13	.57
Gross Motor Behaviors	12.1	16.1	28	8.7	12.3	24	.39	-.21
Sing/Recite/Dance	5.9	9.9	28	8.3	13.2	24	.46	.24
Self-Care Behaviors	3.9	9.6	28	7.9	11.4	24	.17	.42
Transition Behaviors	20.7	10.9	28	19.0	13.0	24	.62	-.16
Attention	23.0	18.3	28	25.1	16.3	24	.66	.11
None	.0		28	.1	.6	24		
● Competing Behaviors								
None	78.2	16.0	28	77.4	14.3	24	.84	-.05
Off-task Behaviors	19.8	14.4	28	18.7	10.7	24	.76	-.08
Self-Stimulation	1.3	2.9	28	1.7	4.6	24	.70	.14
Acting Out Behaviors	.5	1.2	28	.3	.8	24	.33	-.17
● Talk								
No Talk	94.5	6.9	28	91.1	7.8	24	.11	-.49
Talk to Teacher	4.0	6.1	28	3.7	5.2	24	.87	-.05
Undirected Talk	.9	2.2	28	1.8	3.2	24	.25	.41
Talk to Peer	.6	1.3	28	1.5	2.6	24	.17	.69
● Engagement								
Appropriate Engagement	42.2	19.6	28	43.2	18.6	24	.86	.05
Appropriate Not Engaged	30.8	17.3	28	29.3	16.1	24	.76	-.09
Appropriate Engagement with Other Behavior	24.7	15.8	28	23.9	11.2	24	.84	-.05
Appropriate-Not Engaged with Other Behavior	2.2	3.8	28	2.9	4.8	24	.54	.18

Examining variables within and across the teacher categories, the groups appear more similar than different. Teachers, overall, responded similarly to children in both groups.

In terms of student behavior categories, the engagement category provides data of interest. Although students in the different groups may have been required to perform different target behaviors, levels of appropriate engagement were similar between the groups. This suggests equal intensity of student behavior between groups.

Overall, it seems clear that the two groups used different instructional formats for instructional activities. Unfortunately, present knowledge of these variables does not allow some formats to be rated as "better" than others. Data on teacher behavior and student engagement suggest the groups were equally intensive. Based on these data, the groups were of equal intensity. The issue of the relation of format differences to intensity will require further analysis.

Cost of alternative interventions. The cost analysis for this study was conducted during the 1988-89 school year. Costs are based on those classrooms involved in the study (two less intensive, two more intensive). Cost estimates are based on a class of 15 students. Even though the number of subjects for the study was not 15/class in all classes, classes were designed for 15 students. Cost data were obtained using the ingredients approach. As shown in Table 6.6, each alternative used direct service and administrative personnel, occupancy, equipment, transportation, and materials and supplies in varying amounts according to the intensity of program.

The less intensive program cost $3,076 per child compared to $5,031 per child for the more intensive program, a difference of $1,955. The average cost per child for the less intensive program is divided by the number of days those children received intervention, 108 days, to obtain the average cost per day equal to $28.48

Table 6.6

Cost Per Child for Jordan Intensity Study

Resources	Less Intensive (N = 30)	More Intensive (N = 30)
Agency Resources		
Direct Services	$1,747	$3,205
Administration		
Preschool	584	584
District	33	55
Occupancy	203	338
Equipment	67	112
Transportation		
Children	380	634
Staff	13	21
Materials/Supplies	49	82
TOTAL	***$3,076***	***$5,031***

per child. Similarly, the more intensive program, which provided 184 days of intervention per child, cost $27.34 per child per day. Daily costs were roughly equivalent. The difference in average total cost per child between the more and less intensive programs clearly results from the extra days of intervention rather than other cost differences.

The three-day program operated one morning and one afternoon class for two hours per day, three days per week. Direct service personnel included a teacher, a speech and language therapist, a physical therapist, an occupational therapist, and two aides in each class. The five-day program also operated a morning and afternoon session. Classes were held for two hours per day, five days per week. The same staff conducted the five-day intervention with the addition of two aides. Of course, direct service staff reported devoting more of their total FTE to the five-day program. The salaries and benefits for direct service personnel were determined according to their FTE devoted to each program alternative.

Preschool administrative personnel included salaries and benefits for the program director and a secretary. Interestingly, they reported spending approximately the same proportion of FTE on administrative duties for both programs. District administration includes the school principal, the special education director, and other necessary district administration, as well as the bus drivers and bus aides. The administrative cost of operating the program on the district level was calculated according to the district's indirect rate for operating federal programs (1.1%). Occupancy charges, including space, maintenance, utilities, and insurance costs were based on the school district leasing cost of $6 per square foot per year. One thousand thirteen square feet were allocated for the three-day program, and 1,688 square feet for the five-day program. Annual equipment cost was determined by taking inventory of all instructional materials, office furniture and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and prorated according to usage by each alternative.

Child transportation included fuel, maintenance, depreciation, and the annualized cost of car seats/restraints. As previously noted, the cost for drivers, bus aides, and transportation administration are included under "administration." Staff travel was based on actual mileage (at $.205 per mile) for the teachers and therapists travel related to the respective intervention programs. The cost of materials and supplies were assessed based on actual usage of these items by each alternative. Economic analyses comparing the costs and effects of each program are in progress.

Data Collection

At pretest, parents of each subject who participated in the study provided demographic information. All children were administered the Battelle Developmental

Inventory (BDI) (Newborg et al., 1984). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. The BDI is being used to assess child outcomes for each of the studies being conducted by EIRI. This measure was selected for use based on the finding of an expert panel convened to help EIRI determine appropriate measures. (More information on the BDI and other EIRI measures may be found in the EIRI 1987/88 Annual Report.)

Parents of children in the study also completed the following scales of family functioning at pretest: Parenting Stress Index (PSI; Abidin, 1986), Family Resource Scale (FRS; Dunst & Leet, 1985), the Family Support Scale (FSS; Dunst, Jenkins, & Trivette, 1984), Family Inventory of Life Events (FILE; McCubbin, Patterson, & Wilson, 1983), and the Family Adaptability and Cohesion Evaluation Scales III (FACES III; Olson, Portner, & Lavee, 1985). These measures assessed, respectively: parent stress, family resources, family support, occurrence of recent significant life events, and functioning of the family in respect to an "ideal" family. When possible, the FSS was completed by both parents. These family measures are part of a core battery of instruments used by EIRI. As discussed earlier, family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although, theoretically, it is assumed early intervention will effect families (Bronfenbrenner, 1979), the specific areas that may be impacted are unknown and may vary dependent on type of intervention. The battery of family functioning measures used here will help to elucidate areas of functioning that may be affected.

At posttest, a similar course of events occurred. Parents of children in the study returned for a test session with their child. The core measures described above were again completed. Parents also provided information on aspects of treatment verification.

Also at posttest, a number of complimentary measures were administered. These complementary measures were site specific and were used to address issues related to the type of EIRI study (e.g., intensity, program variation, etc.) being investigated. The complimentary measures at this site consisted of instruments completed by parents and teachers.

A complimentary measure completed by both the teacher and parent was the Perceptions of Developmental Status (PODS) (Bagnato & Neisworth, 1989). The PODS evaluates adult perceptions of child capabilities on 20 developmental dimensions, which encompass seven domains. Impressions of the child may lead to differences in how teachers and other significant adults interact with the child. Staff of the Jordan program expressed their opinions that the intensity differences may impact more heavily on the social/survival skills than on developmental skills. Therefore, this instrument was selected.

In response to similar concerns, the Cooper-Farran Behavior Rating Scale (CFBRS) (Cooper & Farran, 1988) was completed by teachers. The purpose of the CFBRS is to assess behaviors necessary for successful kindergarten adjustment. The CFBRS assesses both interpersonal and work-related skills.

The Joseph Preschool and Primary Self-Concept Inventory (Joseph) was administered to children. The Joseph is a child-administered test of self-concept. Self-concept may be an area of development affected by early intervention that may impact on future school success.

Recruitment, training, and monitoring of diagnosticians. As a result of the location of this site and its proximity to other EIRI sites, a pool of diagnosticians were available to administer BDIs. Diagnosticians were graduate students in Special Education or Psychology at either Utah State University or the University of Utah. All diagnosticians had received EIRI BDI training. This training included an extensive inservice on BDI administration and scoring. Each examiner was also required to administer a minimum of three BDIs, two of which were observed for quality control. Further, each examiner was "shadow scored" for reliability at least once during each test period. Before posttest, two other people were trained as BDI diagnosticians. These people were certified teachers who were not engaged in full-time work. The same training and quality control procedures described above applied for these people. An average of 9% of all tests were "shadow scored" for interrater reliability. Average agreement was 90% and ranged from 77 to 100%.

All Josephs were administered by one diagnostician. This diagnostician was a graduate student in the School Psychology Program at the University of Utah. The site coordinator provided training on the Joseph prior to the first administration. Children were administered the Joseph during their school day.

Pretesting. Pretest data were collected at the beginning of the academic year. The specific measures administered and procedures for administration have been detailed above.

First posttesting. All children in the study were administered their first posttest at the end of the first academic year (May and June). Posttesting consisted of the core and complimentary measures described above.

Second posttesting. The second posttesting will occur at the end of the 1989-90 academic year. Some children will be in the school-age program while others will remain in the preschool intervention program.

Results and Discussion

The focus of this section will be on those subjects who have completed one year of intervention. This is the only year of intervention these subjects will receive. Analyses for this report are on data obtained from the core and complimentary measures.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 6.2 and discussed earlier. A difference was observed for 5 of 17 variables in those comparisons. Group differences on family and child pretest measures are presented in Table 6.7. Using the same cut-off value for assessing significance as in the demographic analysis, $p \leq .05$ or effect size $\geq .50$, subjects were comparable on all BDI domains, on the BDI Total score, and for chronological age at pretest. On measures of parent and family functioning, group differences were found only on the FACES measure of cohesion. Parents of subjects in the less intensive group indicated a stronger connection of individual family members to the family than the more intensive group. For all other measures of family functioning, including the measures that would suggest differences in the areas of family stress, family resources, family structure, and support systems available to families, the two groups were not significantly different when they entered the study. Overall, the groups were comparable on child and family functioning measures at pretest.

Measures of Family and Child Functioning

Effects for the measures of family and child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Covariates for these analyses were selected based on two factors. Variables on which groups were found to be significantly different at pretest were included as covariates. Correlations between all pretest measures and child and family outcome measures were obtained. Measures that correlated significantly were entered into a multiple regression formula using the child outcome measure as the dependent variable. Measures found significant in this analysis were also considered as possible covariates. This process was undertaken in order to maximize the correlation with the outcome variable in question while including those pretest and demographic variables for which there

Table 6.7

Comparability of Groups on Pretest Measures for Jordan Intensity Site

Variable	Less Intensive $\bar{x}$	Less Intensive (SD)	Less Intensive n	More Intensive $\bar{x}$	More Intensive (SD)	More Intensive n	p Value	ES[&]
• Age in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Battelle Developmental Inventory (BDI)[*]								
DQs for:								
Personal Social	62.3	17.9	28	60.7	13.7	25	.84	-.09
Adaptive Behavior	64.1	20.7	28	67.4	14.1	25	.40	.16
Motor	64.6	20.5	28	68.2	16.1	25	.49	.18
Communication	56.7	14.8	28	55.5	11.0	25	.78	-.08
Cognitive	63.9	16.6	28	63.5	14.5	25	.91	-.02
TOTAL	61.5	13.6	28	61.7	9.5	25	.78	.01
• Parenting Stress Index (PSI)[**]								
Total (range 101 to 504)	237.5	29.9	28	233.7	55.4	25	.75	.13
Child Related (range 54 to 270)	112.5	17.9	28	114.6	30.3	25	.78	-.06
Other Related (range 101 to 504)	125.0	19.1	28	119.1	30.1	25	.39	.31
• Family Adaptation and Cohesion Evaluation Scales (FACES)[+]								
Adaptation (range 0 to 26)	4.0	2.5	28	4.5	3.3	25	.54	-.2
Cohesion (range 0 to 30)	3.5	2.6	28	4.9	2.5	25	.05	-.54
TOTAL (range 0 to 40)	5.6	3.0	28	7.0	3.3	25	.13	-.47
• Family Resource Scale (FRS)[^] (range 30 to 150)	116.1	15.3	28	122.8	20.2	25	.18	.44
• Family Support Scale (FSS)[^] Total Score (range 0 to 4)	2.1	.7	28	2.1	.7	25	.99	.0
• Family Index of Life Events (FILE)[**] (range 0 to 71)	9.8	5.1	28	11.4	7.9	25	.40	-.31

NOTES:

[*] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[^] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources reported as being available. Higher scores are considered better. For the FSS, the score presented represents the sum of perceived support divided by the number of reported sources.

[**] The PSI and FILE are based on raw scores where lower scores are considered better.

[&] Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, Faces, and FILE, the numerator for the ES is calculated as: More Intensive minus Less Intensive as lower scores are preferred.

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were significant differences between the less intensive and more intensive group. The specific covariates used for each analysis are included in the tables.

Results of Child Functioning

Twenty-three child functioning variables were examined and are presented in Table 6.8. The p values at $\underline{p} \leq .05$ suggest significance for only three child functioning measures (BDI motor, BDI cognitive, and teacher PODS sensorimotor). The p-value of .00 for average length of intervention in days gives further evidence of the design differences between the more intensive intervention of the experimental group as compared to the control group. The measure of effect size, using a cutoff of .50, shows three variables as possibly having functional significance. One of these variables (PODS sensorimotor) has both a significant effect size and p value, leaving group differences for child functioning on five variables. Four of these five favor the more intensive group.

The CFBRS measure of Interpersonal Skills demonstrates a higher value for the less intensive subjects. This indicates better personal-social skills for these subjects as demonstrated in classroom situations. The CFBRS finding in the area of interpersonal skills is not reflected by the BDI personal-social domain. This may have occurred because the teacher completed the CFBRS, where the parent reported on personal-social skills for the BDI.

The results of the analysis offer some evidence that the more intensive condition resulted in higher measures of child functioning than the less intensive condition. P values that were significant and favored the more intensive group appear for the BDI motor and cognitive domains. Further, the Joseph gives an effect size of .61 in favor of the more intensive intervention program (although a p value of .11 does not clearly confirm the effect size finding). The BDI motor skill result is supported by the teacher reported sensorimotor PODS score (an area which includes gross and fine motor functioning). A p value of .001 and effect size of .50 for this

Table 6.8

Posttest Measures of Child Functioning for Jordan Intensity Study

		Less Intensive				More Intensive						
Variable*	Covariates+	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES^	P Value
Average length of intervention in days	—	109.	2.5	--	28	178	11.4	--	25	977.5	27.6	.00
Average length of intervention in months	—	9	00	–	28	8.88	.60	–	25	1.12	.00	.29
Age in months at posttest	—	57	6.8	--	29	57	7.9	–	25	0.10	.00	.75
Battelle Developmental Inventory												
Personal Social	1, 8, 18, 19	110	27	112	28	114	23	113	25	.08	.04	.77
Adaptive Behavior	2, 8, 18, 19	72	15	73	28	77	10	76	25	1.40	.20	.24
Motor	3, 8, 18, 19	98	20	99	28	106	18	105	25	4.95	.30	.03
Communication	4, 8, 18, 19	55	16	54	28	54	13	55	25	.02	.06	.89
Cognitive	5, 8, 18, 19	45	12	45	28	48	12	49	25	4.26	.33	.05
TOTAL	6, 8, 18, 19	381	73	384	28	400	58	397	25	3.03	.18	.09
Joseph TOTAL	1, 8, 18, 19	17.3	3.1	16.8	28	18.2	5.3	18.7	24	2.64	.61	.11
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	6, 8, 18, 19	5.5	.6	5.4	23	5.0	.8	5.0	21	3.66	-.67	.06
WRS	6, 8, 18, 19	3.8	1.0	3.9	28	3.8	1.0	3.8	23	.01	-.10	.93
Perceptions of Dev. Status (PODS) by Teacher												
General Development	6, 8, 18, 19	2.9	.9	2.9	28	3.2	.6	3.2	25	2.51	.33	.12
Communication	5, 8, 18, 19	3.2	.7	3.1	28	3.3	.6	3.3	25	.29	.14	.59
Sensorimotor	3, 8, 18, 19	3.9	.6	4.0	28	4.4	.4	4.3	25	12.72	.50	.001
Physical	3, 8, 18, 19	3.9	1.0	4.0	28	4.2	.6	4.1	25	.52	.10	.47
Self Regulation	3, 8, 18, 19	3.5	.9	3.5	28	3.6	1.0	3.6	25	.33	.11	.57
Cognition	5, 8, 18, 19	2.7	1.0	2.8	28	3.0	.8	2.9	25	.45	.10	.51
Self-Social	6, 8, 18, 19	3.3	1.0	3.2	28	3.4	.8	3.5	25	.68	.10	.41
Parent PODS												
General Development	2, 8, 18, 19	3.6	.8	3.5	28	3.3	.7	3.3	24	.82	-.25	.37
Communication	1, 8, 18, 19	3.6	.6	3.5	28	3.6	.7	3.7	24	1.17	.33	.28
Sensorimotor	3, 8, 18, 19	4.1	.5	4.2	28	4.4	.4	4.4	24	2.05	.40	.16
Physical	2, 8, 18, 19	4.3	.5	4.3	28	4.4	.5	4.4	24	.34	.20	.56
Self Regulation	1, 8, 18, 19	4.0	.6	4.0	28	3.9	.8	3.9	24	.68	-.17	.42
Cognition	6, 8, 18, 19	3.6	.8	3.7	28	3.5	.8	3.5	24	.77	-.25	.39
Self-Social	6, 8, 18, 19	3.9	.5	3.9	28	3.8	.8	3.7	24	1.10	-.40	.30

NOTES: * Statistical Analysis for assessment instruments were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home.

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area of PODS implies that teacher of subject in the more intensive group perceived better motor functioning for these subjects than the less intensive subjects. In fact, all the significant p values favor the more intensive group. However, the intensity of the intervention did not affect most outcomes of child functioning that were directly assessed nor did it affect most teacher perceptions. No parent perceptions were affected.

Results of Family Functioning

Table 6.9 presents the effects of alternate degrees of intensity on measures of family functioning at posttest from the PSI, FACES, FRS, FILE, and FSS. Two variables in this table are worthy of discussion. The Total PSI p value, a $\underline{p} = .06$, indicates higher parental stress for the less intensive group than the more intensive. The other tests of family stress are not different between groups. The FACES measure of cohesion also shows a difference between families of the subjects, with the more intensive group reporting less family cohesiveness than the less intensive group.

Family members who have lower scores on the FACES cohesion indicate a more positive emotional bonding with one another than families that score higher on this test. The same families are indicating a higher level of stress, through their total PSI score, which includes the following subscales for child characteristics: adaptability, acceptability, demandingness, mood, activity level, and reinforcing qualities; and parent characteristics, including depression, attachment, restriction of role, sense of competence, social isolation, relationship with spouse, and health. Child and parent characteristics such as acceptability and social isolation may affect feelings of cohesion and enmeshment in those families. FACES attempts to measure the level of family satisfaction by evaluating the difference between actual family functioning in areas like bonding, coalitions, and interests and those perceived by the family as ideal functioning for the same areas. The less intensive

Table 6.9

Posttest Measures of Family Functioning for Jordan Intensity Study

		Less Intensive					More Intensive							
Variable[*]	Covariates[+]	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	ANCOVA F	ES[^]	P Value
Parenting Stress Index (PSI)[**]														
Child Related (range to)	8, 11, 18, 19	118	26	119	88	28	112	22	111	76	25	2.54	.31	.12
Other Related (range to)	8, 12, 18, 19	131	17	128	63	28	117	26	120	48	25	2.62	.47	.11
TOTAL (range to)	8, 13, 18, 19	249	39	247	78	28	229	43	231	63	25	3.80	.41	.06
Family Adaptation and Cohesion Evaluation Scales (FACES)[+]														
Cohesion (range to)	8, 18, 19	2.8	2.1	3.0		28	5.1	3.7	4.9		25	4.94	-.90	.03
Adaptation (range to)	8, 9, 18, 19	3.7	2.7	3.5		28	3.7	1.9	3.9		25	.41	-.15	.52
TOTAL (range to)	8, 10, 18, 19	5.2	2.6	5.2		28	6.7	3.4	6.7		25	2.72	-.58	.11
Family Resource Scale (FRS)[&] (range to)	8, 14, 18, 19	123	15	126	65	28	125	17	122	57	25	1.43	.27	.24
Family Index of Life Events (FILE)[++] (range to)	8, 15, 18, 19	9.6	5.5	10.0	40	28	8.9	6.5	8.5	47	25	.98	.27	.33
Family Support Scale (FSS) Total Score by mother[@]	8, 16, 18, 19	2.0	.8	2.0		28	2.2	.8	2.2		22	1.88	.25	.18

NOTES: [**] Analyses for the PSI and FILE are based on raw scores. Lower scores are considered better.

[@] Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

[+] Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

[*] Although analyses were based on raw scores, percentile information is presented for ease of interpretation on the PSI, FRS, and FILE. Percentile information is based on the raw score or adjusted raw score and was obtained from data collected across all EIRI longitudinal studies for the FRS. Percentile information for the PSI and FILE are based on the authors' normative sample.

[^] Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, Faces, and FILE, the numerator for the ES is calculated as: More Intensive minus Less Intensive as lower scores are preferred.

[+] Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home.

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group indicated that their ideal picture of family cohesion was closer to the family's actual level of cohesion than the more intensive group's responses indicated.

It is possible that the increase in motor skills of the more intensive group relative to those of the less intensive group improved the more intensive group's stress score, in particular as it affected health of the family. Of the ten variables of family functioning that were evaluated, it may be more significant that eight of these were not significant. The differences in the remaining two may be due to sampling fluctuation.

Conclusions

This study compared two common intensities of preschool intervention for children with handicaps; a three-day-per-week vs. a five-day-per-week program. Results from the Battelle Developmental Inventory, on the motor and cognitive domains, favor the more intensive group. Parent and teacher perceptions of child development were not, overall, differentially affected by program. There is weak evidence in favor of increased self-concept in the more intensive group and, clearly, less development of interpersonal skills.

The results from measures of family functioning are mostly equivocal. Parent stress was higher in the less intensive group, yet these families were more cohesive at posttest. It is possible that stress related to intervention was increased as a result of an inconsistent schedule for the child. This inconsistent schedule, although affecting stress in a negative way, may increase parent/child contact time and possibly affect cohesion in a positive way.

Overall, these results suggest a small benefit on developmental skills of the more intensive program. The gains of the more intensive group in motor skills as it is confirmed by two different motor measures, the BDI and the Teacher PODS, can be clearly attributed to the different intensity of intervention. The gains in motor skills made by the more intensive subjects as measured by effect size of the BDI and PODS implies a 1/3 to 1/2 standard deviation increase in motor skills above the control subjects. This moves the more intensive subjects from the second percentile level of motor development to the fifth percentile for their age group. The cost of this difference in development is about $2,000 per child or a 70% higher level of spending on the more intensive group than on the less intensive subjects to achieve this gain in motor skills. Other, non-motor, benefits may also have resulted from this increased spending. The positive effect size of the Joseph and the BDI cognitive p-value must be interpreted more cautiously as they are not confirmed by other similar measures of self-concept and cognition such as the PODS. There may also be benefits that result from the increased spending of the more intensive program that do not appear in the measures used to capture differences in child and family functioning. These differences may appear in the lives of the children as they move through primary and secondary school and into adulthood. These benefits must be weighed against program costs and the needs of a district.

The longitudinal questions raised by this study are also very important. Are these immediate effects temporary? Another intensity study (Sandow, Clarke, Cox, & Stewart, 1980) found similar immediate differences that disappeared with time. Does the more intensive program better prepare children for later school functioning? Although the current results suggest it does not, measures used may be missing important qualitative aspects of behavior. These and other questions will be answered longitudinally.

Future Plans

Intervention activities at this site are completed. Of the children in this study, 33 will be entering school-age programs in fall, 1989. The large sample size and the methodological rigor of this study strongly suggest that current results are valid. No difference would be expected if the study were replicated. The large numbers of subjects moving to a new program would weaken any attempts at examining a duration variable combined with the intensity variable.

All subjects in this study will be followed longitudinally. Long-term effects from the more intense intervention are possible. Conversely, the immediate gains observed in this study may be temporary. Longitudinal data are critical to clearly understanding the effects of programs of different intensity.

Collaborative activities with the Jordan School District are continuing, and will serve to keep EIRI informed of the future placements of children involved in this study. The district will also help to keep us informed of any subjects who move to other parts of Utah or out of state. Follow-up testing is currently scheduled for May and June 1990.

Follow-up activities will not only include aspects of the test battery currently used, but contacts with the child's teacher will be made to obtain teacher reports of child behavior. The names of each child's teacher will be obtained during the follow-up testing, along with permission to contact them. Teacher contacts will occur in the summer to minimize lapses in teacher memory while capitalizing on their available free time. In addition, a tracking system to prevent future attrition is in place. This system includes current addresses of subjects and address information on next of kin. Greeting cards will be sent on appropriate occasions (e.g., Birthday, Christmas) to provide an indication if the subject remains at his/her listed address.

Based on experience with the Jordan School District and the tracking system, attrition is expected to be minimal. The findings resulting from these longitudinal activities will help provide a strong data base to evaluate decisions related to program intensity.

SALT LAKE CITY IVH PROJECT

Project #7

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age vs. services begun at 18 months adjusted age.

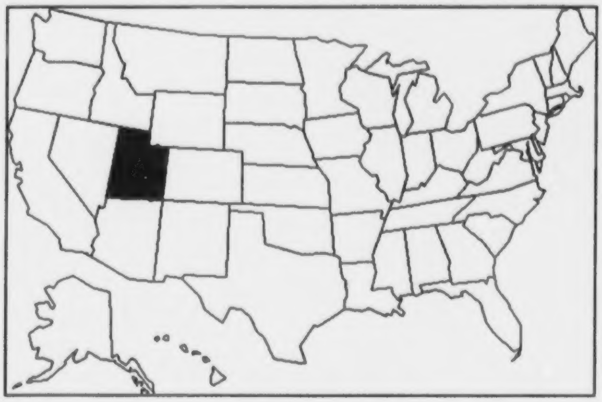
LOCAL CONTACT PERSONS: Gary Chan, University of Utah Medical Center; Jack Dolcourt, Primary Children's Medical Center

EIRI COORDINATOR: Nancy Immel

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 10-9-89

Rationale for the Study



Since the implementation of Public Law 94-142, an act which made provisions for educational assistance to all handicapped children, there has been a dramatic increase in the availability and quality of services for handicapped infants and children (Mulliken & Buckley, 1983). Public Law 99-457 has brought about another dramatic increase. These increases have been accompanied by a heightened public awareness of the importance of treating the infant once a handicap has been identified, and of directing efforts toward earlier identification, prediction, and prevention of such conditions (Bennett, 1987).

In the search for early identification strategies, Bennett (1987) has suggested that the low birthweight infant may be the prototype for understanding the development of most biologically at-risk infants. This statement is made because survival rates for low birthweight infants bear a direct relationship to their birthweights, and the surviving infants are particularly vulnerable to handicapping conditions. One particular subset of low birthweight infants, those infants who have experienced cerebral intraventricular hemorrhage (IVH), was selected for this study.

The National Center for Health Statistics (1989) reports that 6.8% of all live births in 1986 were of infants weighing less than 2500 g; infants weighing less than 1500 g accounted for 1.2% of live births. Approximately 40% of low birthweight infants experience IVH (Bowerman, Donne, Silverman, & Joffe, 1984). This high incidence of IVH has caused the condition to be seen as the major health problem in the Neonatal Intensive Care Unit (NICU) (Volpe, 1987). In fact, a distinguishing characteristic of IVH infants is their propensity to develop serious medical complications (Sostek, Smith, Katz, & Grant, 1987).

An estimated 50-60% of infants who suffer IVH survive (Volpe, 1981); however, information on the future developmental progress in this population is limited and controversial (Hynd et al., 1984). Sostek et al. (1987) found that although level of Grade I or II vs. Grade III or IV IVH was not related to Bayley mental and motor scores at two years of age, as a group, 40% of the children suffering IVH showed severe delays. At older ages, the findings are somewhat equivocal. For example, Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Stage One and Two LBW infants exhibited moderate handicapping conditions by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these handicaps. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Stage Three or Four IVH demonstrated moderate to severe handicapping conditions by the third year of life. Bozynski et al. (1984) suggested that neonatal IVH typically resulted in motor rather than mental impairment, particularly in survivors of Grade IV hemorrhage.

The rationale for using IVH infants was that, given a subject population which is at extreme risk for experiencing neonatal complications associated with developmental dysfunctions (e.g., severe asphyxia, intrauterine growth retardation, neonatal meningitis, encephalitis, seizures, bronchopulmonary dysplasia, respiratory distress syndrome, apnea, and vision and hearing problems), it was important to determine if interventions beginning early in life could prevent the development of later handicapping conditions in IVH infants and reduce the levels of stress experienced by the families of these infants.

An important question which needs further clarification is the age at which intervention should start for infants who have serious medical problems and who routinely spend up to three months in intensive care units. Recent early intervention literature describes various ages at which interventions with low birthweight infants began and reported conflicting results. The age at which intervention started ranged from time of admission to the NICU (Resnick, Armstrong, & Carter, 1988; Resnick, Eyler, Nelson, Eitzman, & Bucciarelli, 1987), to intervention begun during the last week of NICU hospitalization (Nurcombe et al., 1984; Rauh, Achenbach, Nurcombe, Howell, & Teti, 1988), to intervention begun at "term" (infants anticipated delivery date) (Piper et al., 1986), to intervention begun at 10 months (Bromwich & Parmalee, 1979), and intervention begun at from 12 to 19 months of age (Palmer et al., 1988).

Resnick et al. (1988) reported that the combination of in-hospital multi-modal intervention and home-based developmental intervention during the first 12 months of life resulted in significant gains in child mental development and in the quality of parent-child interactions. Also reported by Resnick et al. (1987) were the results of in-hospital intervention plus home-based developmental intervention during the child's first 24 months of life. These results indicated that the infants receiving intervention scored significantly higher on a measure of both mental and motor development at 12 and 24 months adjusted age than did infants receiving no intervention.

Taken together, these two studies suggested that early intervention began when infants are admitted to the NICU results in positive developmental outcomes. Factors inherent in each study, however, limit the usefulness with which these results can be interpreted. For example, in the first, the positive effects found at 12 months were short-term effects. The positive effects found at 12 and 24 months in the second study, while providing a comparison at two points in time, were weakened significantly by the attrition of 75% of the subjects.

Two recent studies looked more specifically at the short-term effects of early physical therapy services with high-risk infants. In a study of 134 randomly assigned high-risk infants, where intervention was initiated at the infants' anticipated delivery date, Piper et al. (1986) found no differences between groups on any developmental outcome measures following one year of physical therapy services to the experimental group. Also reporting the efforts of a randomized study, Palmer et al. (1988) compared 12 months of physical therapy to 6 months of infant stimulation followed by 6 months of physical therapy to infants demonstrating spastic diplegia. Therapy for both groups was initiated when the infants were 12 to 19 months old. Results of the study favored the infants receiving the early infant stimulation followed by physical therapy on outcome measures of motor, cognitive, and social development.

Conventional wisdom has suggested that "earlier is better," and White, Bush, and Casto (1985-86) reported that 18 of 24 reviewers of early intervention literature indicated that earlier intervention was more effective than later intervention. In a meta-analysis of 74 studies of early intervention with handicapped children from birth to 5 years of age, however, Casto and Mastropieri (1986) concluded that there was little evidence to support "conventional" wisdom. Clearly, there is no consensus as to the most effective age at which to begin early intervention.

Previous to this study, IVH infants in Utah received only medical follow-up. This situation provided an opportunity to test an early versus later intervention hypothesis by offering additional services to one group of IVH survivors. EIRI staff have worked closely with Primary Children's Hospital and the University of Utah Medical Center in the past, and have established an excellent working relationship for this longitudinal study. It provides a rare opportunity for a high degree of replication of another study (Project #8), but with sufficient variation in the intervention to illuminate some of the parameters regarding the optimal level of intervention program for which theory provides no clear guide. From a systems theory perspective (Ramey, MacPhee, & Yeates, 1982), it seems important to document how education, social service, and medical systems interact with each other and how each in turn affects the family system.

Overview of Study

This study used random assignment procedures to examine the differential effects on children and families of beginning a home-based early intervention program at 3 months corrected chronological age (age corrected for prematurity),[1] or to a comparison group which received the medical follow-up services that have been available in the past until they are 18 months of age (also corrected for prematurity). At 18 months, children in both groups received a home-based intervention program.

Prior to the implementation of services for this research project, the services to all infants included neonatal care at the respective hospitals and referral to the Utah State Department of Health Neonatal Follow-Up Clinic or follow-up from private physicians. Previous funding for these services was provided by the Utah State Department of Health. However, those parents who did not access the NICU follow-up clinic paid for services themselves. This remains the standard level of care for all infants released from an NICU in the treatment area. Subjects in the delayed intervention group received no other services associated with this project until they were 18 months of age. However, parents were free to access other services in the community if they desired. Parents were queried annually about services they accessed during the time of the study.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

The intervention services for this study began with referral to the project by staff members at the University of Utah Medical Center and Primary Children's Medical Center, who initially contacted the parents and referred the interested parents to the site coordinator. When a child was enrolled, the project provided a package of services delivered by independent providers, including a licensed physical therapist, a child development specialist, and trained developmental examiners. The services provided by these professionals are coordinated by the EIRI site coordinator.

Methods

This section presents the procedures for subject recruitment and assignment, the demographic characteristics of the groups, a description of the alternative intervention programs, and a discussion of the procedures for treatment verification and cost analysis.

Subjects

There are currently 57 children between 10 months of age (age corrected to 40 weeks to control for prematurity) and 54 months (actual ages were used after the children reach three years of age) enrolled in the study. Subject recruitment ended in March 1989, at which time a total of 62 subjects were enrolled.

Recruitment. Infants qualified for participation in the study if they were a patient in a Neonatal Intensive Care Unit (NICU) at either Primary Children's Hospital or University of Utah's Medical Center, if they experienced perinatal intraventricular hemorrhage (IVH), and if they resided in the catchment area for treatment. Subjects were matched on severity of hemorrhage and birthweight prior to random assignment to experimental or control groups. Severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories.

Assignment to Groups. Subjects who met the inclusion criteria were identified upon discharge from the respective NICU. Parents of eligible infants were contacted via mail by the medical center in which the infant was a patient the month prior to reaching 3 months corrected age. For each infant who met the study criteria, parents were required to indicate willingness to participate in either of the experimental conditions, depending upon where random assignment placed them. Infants were randomly assigned to the early intervention or delayed intervention conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1500 g or over 1500 g). Parents were informed of their infant's assignment after they gave approval to participate in the study.

The only person at the site who knew the actual order of eligibility and enrollment of subjects was the EIRI site coordinator. In addition, the dates on which infants were assessed was carefully tracked to ensure that infants were assigned in the order in which they were eligible for initial pretesting.

Subject attrition. Many of the children in this study had medical concerns which necessitated returning to the hospital for a period of time, yet the study was extremely successful in assessing infants on schedule and had very low attrition. Of the 58 infants enrolled, only one child, who died after the second posttest, was lost to attrition.

To minimize attrition, the interveners and site coordinator in this project maintained updated telephone numbers and addresses for the participants. Data were collected in person or by mail approximately every 6 months for the child's first 18 months and monthly after 18 months, so there was frequent contact with the families. Arrangements were also made to provide intervention services and assessment for those participants who moved to another state. For example, children were assessed in the states of New Jersey, Georgia, Washington, Wyoming, Colorado, California, and Idaho. In each case, qualified examiners who were "blind" to the child's group membership were located to administer follow-up assessments.

Demographic characteristics. Demographic information was gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Most of the children were from families residing in the urban areas surrounding Salt Lake City and Ogden, Utah. Seventy-seven percent of the subjects currently lived in the Salt Lake City and Ogden area, while 16% lived in rural areas of Utah, Idaho, or Wyoming. Two families lived in California, one family lived in Georgia, and one family lived in Washington. The current sample was composed of 89% Caucasian infants and 11% non-Caucasian infants from both urban and rural areas. Ninety-eight percent of the participants lived in homes where English was the primary language, and the greater majority (95%) lived in two-parent families. The educational level of the mothers ranged from 8th grade to college graduate, with a mean education level of 13.1 years. The fathers' education level ranged from 9th grade to Ph.D., with a mean of 13.8 years of education. Annual family incomes ranged from $5,000 per year to over $50,000 per year. Median yearly income for the families was $25,991. A comparison of the early and delayed intervention groups on demographic characteristics will be discussed in the Results section.

Intervention Programs

The intervention was conducted in two phases for this project. The first phase provided sensorimotor intervention to the early intervention (experimental) group beginning at 3 months corrected chronological age, while the delayed intervention (control) group received the current level of community service (referral to the NICU follow-up clinic). The second phase, delayed intervention, was received by all infants in both groups. Delayed intervention began when the infants reached 18 months corrected age and consisted of home- and/or center-based intervention services based on the Curriculum and Monitoring System (CAMS).

The Curriculum and Monitoring Systems (CAMS) was designed to meet the educational needs of young handicapped children served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS was one of only 21 early intervention projects validated by the JDRP. MAPPS was also a National Diffusion Network (NDN) program and had replication sites nationwide.

Each of the CAMS programs were printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS could be used by parents, teachers, and paraprofessionals in the home or an institutional/school setting. The five CAMS programs were: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development.

The ***Receptive Language Program*** teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building and articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self-care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills, including both child-adult and peer interactions.

Early intervention service. At three months corrected age, children in the early intervention group were referred to a licenced physical or occupational therapist for initial sensorimotor evaluation using the CAMS Motor Placement Test. At that time, scheduling and programming were discussed with the family. Frequency of intervention was determined by CAMS test scores, the type and quality of the infant's movement patterns, and the amount of interactive time available to parents. Most infants were seen one to two times per month during the first few months when movement patterns were limited. The treatment schedule was flexible so that weekly visits were scheduled if abnormal patterns or tone were noted, or if significant delays persisted. However, if normal development with good quality of movement was proceeding, intervention was limited to monthly or follow-up visits. Similar levels of early intervention program intensity for low birthweight infants have been described by Resnick et al. (1987; 1988), Rauh et al. (1988), Field et al. (1980), Nurcomb et al. (1984), and Piper et al. (1986).

Treatments consisted of activities to encourage appropriate movement patterns in a normal developmental sequence. The activities were updated constantly to accommodate progress and were designed to be integrated into daily family routines. Parents were present during treatment sessions which were approximately 45 minutes in length and included a review of progress on treatment goals, direct therapy, and an opportunity for the parent to work with the child. Parents were provided with written and illustrated home program activities. Parents were asked to work with the child at home at least 20 minutes per day, five days per week, on techniques they had learned in the intervention sessions. The level of parental intervention and program involvement was used in analyzing the outcome for the children to determine if degree of parent involvement affected developmental outcome of the child.

Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes. The CAMS placement test checklist was updated as goals were met. If a child required other equipment or services, or if the family needed financial assistance to buy rehabilitation equipment, the physical therapist referred the family to agencies in the Salt Lake City area or attempted to obtain equipment no longer being used by other children. The physical therapist also maintained a supply of equipment which she provided to subjects at no-cost.

Delayed intervention. At 18 months corrected age, the infants in the delayed intervention group also began to receive intervention services. The focus of intervention became center- and/or home-based for both early intervention and delayed intervention children. Therefore, all children at 18 months corrected age were assessed using the CAMS and goals were established for intervention.

The child development specialist met with the parent and child for one-hour once each month and provided intervention in the area(s) of need identified by the CAMS placement test and by parent concerns. The parent was asked to spend 20 minutes each day 5 days each week providing similar intervention with their child at home. The child development specialist talked with the parent via telephone at least once between clinic appointments to check on progress and answer questions.

A monthly home visit by the child development specialist established goals for the child dependent upon the CAMS placement test. A typical intervention session was usually 45-60 minutes in duration. Each session began by asking how the child was doing and followed up on any problems (medical, family, etc.) discussed at the last visit. Then, using CAMS, the intervenor assessed the child's progress on the items suggested for home activities in the previous session. If the child passed these items, new activities were suggested and demonstrated. Following the assessment, the intervenor and child played with selected toys designed to teach age-appropriate skills (shape sorters, bead stringing, puzzles, etc.). Before the session ended, the intervenor wrote down the suggested activities, gave examples showing how to teach these activities, provided appropriate toys if necessary, and answered any questions the parent had.

For example, if the objective for a child was to point out facial features, the child development specialist taught the parent an exercise to teach the child facial features. When the next meeting occurred, the child development specialist asked the child to point out facial features. If the child showed competence in that area, a new objective was established. Some children had objectives in several domains, while others had only one area of delay. The child development specialist also provided recommendations to parents regarding problems or concerns such as toileting or behavior. When the child development specialist returned, she had the child demonstrate the new behavior, and if the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was referred to the physical therapist for motor intervention. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received services from the child development specialist only. The physical therapist followed the same procedures outlined in the early intervention service section.

During the past year, the focus of service provision changed slightly as appropriate community services became more available to young children with handicaps. In compliance with P.L. 99-457, the Utah Departments of Health and Education developed more early intervention and education programs to meet the special needs of these children. While children in the study continued to receive the interventions as previously described, greater emphasis was placed on assisting parents in accessing community services when their children entered the delayed intervention phase. Children have received both public and private preschool services, occupational, physical, and speech/language therapies, and services to the hearing and visually impaired.

In summary, all children began individualized intervention services at 18 months corrected age. Some children also obtained other services in the community. The access of services by the family was monitored on a yearly basis when parents completed an "additional services form."

Treatment verification. A number of procedures were implemented to verify that treatment was implemented as intended. Table 7.1 shows treatment verification data for subjects posttested at 18 months CCA (Posttest #1) and at 30 months CCA (Posttest #2) They include:

1. *Collection of attendance data*. Both home visits and clinic visits were recorded in the subject's file. Phone contacts also were noted in the subject's chart by both the physical therapist and child development specialist. For the delayed intervention group, statistics regarding utilization of the NICU follow-up service were obtained from that agency. Only 2% of the children referred to the NICU follow-up service actually used that service. Between Pretest and the 18-month Posttest at

Table 7.1

Treatment Verification Data for Salt Lake City Age-at-Start Study

Variable	3 - 18 months CCA (Posttest 1)							19 - 30 months CCA (Posttest 2)							
	Delayed Intervention Group			Early Intervention Group			p Value	Delayed Intervention Group			Early Intervention Group			p Value	ES[$]
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
• Intervenor Ratings of Parents [*] [^]															
Involvement with Program				2.64	.58	22		2.58	.69	19	2.53	.77	19	.83	-.07
Knowledge of Child's Condition and Program				2.18	.73	22		2.58	.61	19	2.26	.73	19	.16	-.48
Support of Child's Program				2.27	.63	22		2.50	.79	18	2.26	.65	19	.33	-.33
• Hours of Sensory Motor services provided by project				18.2	9.2	23									
• Hours of early intervention services provided by project								100.6	158	19	69	182	19	.57	-.19
• Parent ratings of satisfaction with child's program [^]				3.86	.36	21		3.73	.47	11	3.67	.50	9	.78	-.13
• Additional Services[$] % receiving ≥ 1 hr. speech, physical, or occupational therapy/mo.	17	---	29	22	---	23	.69								
• %receiving ≥ 1 hr. preschool or daycare/mo.	17	---	29	30	---	23	.27								
														$\overline{X}$ ES = -.24	

[Δ] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions.

[*] Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

[^] Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age and therefore, Intervenor Ratings of Parents, Total Intervention Sessions Received, and Parent Ratings of Satisfaction, are not reported. Some infants in the Delayed Intervention group did receive community based services as reflected by Additional Services data.

[x] These services include sensory motor and developmental intervention.

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18 months corrected age, infants in the early intervention group attended an average of 13.2 physical therapy visits. Between the posttest at 18 months corrected age and the posttest at 30 month corrected age, the average number of intervention sessions reflects both physical therapy visits, visits with the developmental specialist, and visits to community early intervention services.

2. ***Parent satisfaction with program*.** Annually, parents were requested to complete a questionnaire regarding their satisfaction with the intervention services delivered by this program. The questionnaire consisted of seven program qualities that were rated on a scale of 1-4, with 4 being the most favorable rating. The seven items were averaged to give a rating of satisfaction which ranged from 1-4. Parents in both the early and delayed intervention groups consistently rated the intervention favorably and group means ranged from 3.73 to 3.86.

3. ***Intervenor ratings of parents*.** Intervenors rated the parents annually on their support of, and involvement with, their child's program, and on their knowledge of their child's condition and program. The parent qualities were rated on a scale of 1-3, where 3 represented the most favorable rating. Mean scores ranged from 2.18 to 2.64, indicating that intervenors rated parents as having above average parent involvement qualities and as knowing a great deal about their child's condition.

4. ***Additional services*.** As part of each posttest evaluation, parents were requested to provide information about any additional therapeutic services their child received during the previous year. Table 7.1 shows the percentage of subjects who received more than 1 hour of occupational, physical, or speech therapy and more than 1 hour of preschool or daycare per month. The results of the statistical analysis indicated that there were no significant differences between groups in the percentage of subjects who received additional services.

5. ***Site review*.** A formal site review of the Salt Lake City IVH project was completed on July 25, 1989. Those participating in the site review included the site

coordinator, the physical therapist, and child development specialist. The purpose of the review was to collect information about the nature and quality of early intervention services that were delivered, to verify that the research conducted by EIRI was implemented as intended, and to collect needs assessment data which may be useful to site administrators.

The site review was conducted as a part of the treatment verification process which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Part II of the handbook. The site review took place at K2D2, the facility where most of the sensorimotor and CAMS interventions were delivered and included a review of eight randomly-selected subject records, observations of one sensorimotor and one CAMS intervention session, interviews with intervenors, and inspection of the facility.

The review team found that there were substantial differences in the services provided to each group. Intervention services judged to be of high-quality were provided to the early intervention group prior to 18-months CCA and to both groups after 18 months CCA. Assessment procedures were carried out regularly, appropriate plans and records documenting interventions and child progress were in place. It was found that several of the older subjects in the study were working on the final objectives in the CAMS curriculum. It was recommended that those children who were functioning at or above age level continue to be monitored to see if they experience subsequent problems with regard to developmental delays, but as long as they are functioning at this level, that specific intervention strategies will not be implemented.

Based on the site review findings, no further recommendations were offered. Services continue to be provided to children in both treatment groups as previously described.

***Cost of alternative interventions*.** The cost per child for the early intervention group (23 children) represents an accumulated cost of intervention from July 1986 to June 1988, the total program cost for two years and two phases of intervention as outlined under the intervention program description. The cost per child for the later intervention group represents the cost for services from the date these 29 children turned 18 months of age and services began until July 1988.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group. As illustrated in Table 7.2, program costs included direct service and program and university administration, occupancy, equipment, transportation, and materials and supplies used for the respective groups.

Table 7.2

Cost per Child for Salt Lake City IVH Site (1986-88)

Resources	12 Months Dev. Int. (N = 29)	12 Months PT + 12 Months Dev. Int. (n = 23)
Agency Resources		
Direct service personnel	$ 634	$1,922
Administration		
program	116	361
university	37	115
Occupancy	71	229
Equipment	41	136
Transportation	17	45
Materials/supplies	27	55
SUBTOTAL	**$ 943**	**$2,863**
Contributed Resources		
Parent Time	655	1,964
Parent Transportation	89	144
SUBTOTAL	**$ 744**	**$2,108**
Total	***$ 1,687***	***$4,971***

Personnel costs included wages and benefits for the physical therapist, the developmental specialist, diagnosticians, a graduate assistant, and a secretary. Each of these were pro-rated according to actual time spent on intervention-related activities. Research costs in this, and all other resource categories, naturally, were excluded. Program administration includes salaries and benefits for the percentage of FTE administrative personnel worked on the project. The university administrative cost applies to the small portion of the project that was operated out of Utah State University. For this, the university indirect rate for general, departmental, and sponsored projects administration was used (31.78%). Occupancy charges include rent paid for office space, utilities, maintenance, and insurance. Equipment costs included the cost of office furniture, computers, intervention toys and treatment equipment, and a supply of equipment available for loans to parents (seating devices, walkers, etc.). These costs were based on market replacement values for each item and annualized at a rate which accounts for interest and depreciation to determine the annual equipment cost. Agency transportation costs for home visits were calculated at $.21 per mile based on actual mileage. The cost for materials and supplies included expenditures on those items.

Because the program relied heavily on parent participation for both intervention and, as the child became older, for transportation to the center, the opportunity cost of parent time was also determined. These costs were presented as "contributed resources" on Table 7.2. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the developmental specialist at one hour each; (2) intervention activities recommended by the program (20 minutes daily) for each parent and child at home; and (3) transportation time and expenses. Parents spent an average of 142 hours in Year One and 71 hours in Year Two in session with professionals and conducting intervention activities at home. Parent transportation costs in Year Two were gathered via telephone interview during which parents reported the number of trips taken to the center, the round-trip distance, and travel time. As reported in the economic section of the report, parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for all working women in the U.S.

Thus, children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents cost $4,971 per child while children entering the program later at 18 months and receiving 1 year of service cost $1,687, including the value of parent time. If costs to parents for their time and transportation were not considered, the cost of early intervention for two years was $2,863 per child, while the cost of delayed intervention for one year was $943 per child. The cost per child for two years of intervention is more than twice the cost for one year. This can be attributed to the emphasis on physical therapy in Year One which cost more than services from the developmental specialist. At 18 months, the program shifted its emphasis for all children in the program from physical therapy to speech, self-help, social, and other age-appropriate skills. Barnett and Escobar (198) calculated that the 1986 dollar costs for estimates of 8 home-based early intervention programs ranged from $1,500 to $4,500 per child per year. The costs of the services provided by the SLC/IVH study for early intervention and delayed intervention fell well within the range cited by Barnett and Escobar (1988) when parent time and transportation costs were considered. The services of both interventions were below the minimum figures cited when parent costs were not included. Further economic analyses relating costs to effects for this site are pending.

Data Collection

Data were collected to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children with intraventricular hemorrhage at birth and the unique experiences of their families. Additional assessments described in this section were administered as the subjects developed additional skills not present in younger children. Table 7.3 presents a schedule of pre- and posttest measures and the ages at which they are administered.

Table 7.3

SLC/IVH

	Pretest			Posttest 1	Posttest 2	Posttest 3	Posttest 4
Age (months)	3	6	12	18	30	42	54
Battelle Developmental Inventory	X			X	X	X	X
FSS	X			X	X	X	X
FRS	X			X	X	X	X
FACES	X			X	X	X	X
SES	X			X	X	X	X
FILE	X			X	X	X	X
PSI	X			X	X	X	X
Additional Services				X	X	X	X
Child Health				X	X	X	X
Binet Screening Test					X	X	X
Preschool Language Scale						X	X
Draw-A-Person							X
Visual Motor Integration							X
Infant Temperament Questionnaire		X					
Toddler Temperament Questionnaire					X		
Carey Behavioral Style Checklist							X
Child Behavior Checklist							X
Parent-Child Interaction Video			X		X	X	X
Motor Video			X				

Infants were pretested by the child development specialist, who did not know the group assignment of the child. Since there was a chance that the child development specialist could have learned of a child's assignment by posttesting, posttest diagnosticians were chosen who had no involvement with the project or the interveners. In this way, it was ensured that diagnosticians were "blind" to the child's membership involvement in the study.

Child functioning was measured at pre- and posttests with the Battelle Developmental Inventory (BDI). The BDI is a norm-referenced, standardized assessment of skill development in children from birth to 8 years of age and assesses five developmental domains: personal social, adaptive, motor (gross and fine), communication (receptive and expressive), and cognitive.

Family functioning was also assessed at pretest and at each posttest. The measures of family functioning included: the Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness and adaptability of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available for families with young children; the Family Resource Scale (FRS), a measure of different kinds of resources available to the family, the Family Inventory of Life Events and Changes (FILE), an assessment of the life events and changes experienced by the family during the previous 12 months. Family demographic information was gathered through the Parent Survey.

Recruitment, training, and monitoring of diagnosticians. Rigorous certification procedures and requirements were implemented to insure the qualifications and reliability of the diagnosticians administering assessments for the SLC/IVH study. Diagnosticians were required to independently become familiar with the BDI through study of the test manuals and viewing of a videotaped test administration. The diagnosticians then completed a 1-1/2 day BDI administration training session conducted by a certified assessment trainer. During the training session, BDI testing procedures were explained, demonstrated, and practiced. Following the training session, diagnosticians completed three practice BDI administrations. The final practice administration was videotaped and then reviewed by the assessment coordinator. After the assessment coordinator verified that the diagnostician had correctly administered the test, the diagnostician began testing children for the study. Three diagnosticians have completed the requirements to administer the pretest and posttest measures. One diagnostician has a Ph.D. in psychology, and two are Ph.D. candidates in psychology. The Ph.D. candidates were recruited from Utah State University and the University of Utah Graduate Schools.

To maintain records on the continued quality of the test results, shadow scoring of 10% of test administrations for each diagnostician was conducted by another trained diagnostician who had three years of experience in administering the BDI. Interrater reliability indicates that the diagnosticians are administering the tests with a reliability level above .90. Testing was scheduled directly with the diagnosticians by the site coordinator.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants were tested with the BDI, and the parents completed the Parenting Stress Index (PSI), the Family Support Scale, (FSS), the Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). All test and questionnaire protocols were sent to the EIRI site coordinator for scoring and placement in the EIRI file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the new-born.

Interim testing. When infants were 6 months corrected age, their parents were mailed the Carey Infant Temperament Scale to complete. This questionnaire was returned directly to the site coordinator via postpaid mail. Parents were paid $10 for their time in completing the questionnaire.

The Carey Infant Temperament Scale assessed the parents' estimate of the infant's temperament. Scoring categorized the infant into easy, intermediate, slow-to-warm, and difficult categories. This information was compared with the ratings of the videotaped parent/child interaction to determine if the child's perceived temperament affects interactions with the parent. Videotapes of parent-infant interaction and one of motor development were completed when the infants are 12 months corrected age, by a trained child development specialist or a licensed physical therapist. These videotaped sequences were rated by trained individuals who are "blind" to the study design and subject assignment to experimental conditions. Parents are paid a $10 incentive for videotaping.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds. Taping continued for two minutes after the parent returned to the room.

The videotape of motor functioning followed a specific script. The motor script encouraged the child to perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

18 month posttest. Infants were posttested at 18 months corrected age and annually thereafter. The infants were administered the BDI and the parents completed the PSI, FILE, FACES III, FSS, FRS, a survey of the additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents were paid $20 for completion of the evaluation.

The posttest data provides information regarding the child's developmental change in the first 18 months (and yearly thereafter), and the effect of intervention services upon the child's development.

30 month posttest. The second posttest occurred at 30 months corrected age. The BDI and the Stanford Binet Intelligence Test Screening Test (Thorndike, Hagon, & Sattler, 1986) were administered to the subjects. The Stanford-Binet Intelligence Scale measures general intellectual ability and was standardized for individuals from 2 to 18 years of age. The screening test consists of one subtest from each domain and includes the following subtests: vocabulary, pattern analysis, quantitative, and bead memory. Correlations between the screening-test battery and the full battery ranged from .92 to .98. In addition to the child functioning measures completed at 30 months, the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, the parent socioeconomic survey, and the Carey Toddler Temperament Questionnaire. In addition, a videotape of parent-child interaction was completed. Parents were paid $25 for completion of the evaluation.

42 month posttest. The third posttest occurred at 42 months actual chronological age. The children were tested with the BDI and the Stanford Binet Screening test. They were also administered the Preschool Language Scale (Zimmerman, Steiner, & Evatt, 1969). The Preschool Language Scale is designed to evaluate language strengths and deficits in the areas of auditory comprehension and verbal ability. It also assesses articulation and was designed for children ages 18 months to 7 years, or children functioning within that age range. Parents were asked to complete the EIRI battery of family measures, the demographic, additional services, child health surveys, and a parent-child interaction videotape. Parents were paid $35 for completing the testing procedures.

54 month posttest. The 54-month posttest included the BDI, the Stanford-Binet screening test, the PLS, the EIRI battery of family measures, the demographic, additional services, and child health surveys, and a parent-child interaction videotape. In addition, further information was gathered regarding neuropsychological and behavioral functioning through assessment instruments that were not appropriate for younger children. Neuropsychological assessment provided information regarding not only areas of brain dysfunction, but attentional problems and learning disabilities. Included in the 54-month posttest were the Child Behavior Checklist (Achenbach, 1988), the Test of Visual Motor Integration (Beery, 1989), and the Draw-A-Man test (Harris, 1963).

The Child Behavior Checklist was standardized for children from 4 - 16 years of age. It was designed to identify child competencies and behavior problems and was completed by the parent. It is reported to have good psychometric properties and has been widely used in both clinical and research settings.

The Test of Visual Motor Integration (VMI) is a standardized assessment of the development of eye-hand coordination skills. The test is designed for children 4 - 17 years of age. The VMI has also been used widely in clinical and research settings and has been found to predict school success when used in conjunction with other assessments.

The Draw-a-Man test is a non-verbal test designed for children from 3 years 0 months to 15 years 11 months of age. The test provides an estimate of developmental level and yields useful information when it is included in an assessment battery (Sattler, 1988). Parents were paid $35 for completing the 54-month assessment battery. The posttesting schedule and number of infants assessed appears below as Table 7.4.

Table 7.4

Testing Schedule for IVH Study

Time of Assessment	Number Assessed to Date
3 Months	58
18 Months	52
30 Months	40
42 Months	21
54 Months	1

Results and Discussion

The purpose of the Salt Lake City IVH study was to compare the effectiveness of intervention begun early (at 3 months adjusted age) to intervention begun later (at 18 months adjusted age) for children with a history of perinatal intraventricular hemorrhage. The children were pretested when they were 3 months corrected age, and posttested at 18 months corrected age and yearly thereafter. The posttest analyses reported here included all children who received the 18- and 30-month posttest.

Comparability of Groups on Pretest Measures

Analysis of pretest comparability of the groups on family demographic characteristics, child medical characteristics, and child and family functioning were performed for (a) all subjects participating in the study, (b) those subjects posttested at 18 months CCA, and (c) those subjects posttested at 30 months CCA. Analysis of family demographic characteristics (Table 7.5) indicated that of the 17 variables on which comparisons were made, there were statistically significant differences between the groups for only two (years of education for the father and percent of fathers employed as technical managerial or above). Given the many variables on which comparisons were made, it is not surprising that there were

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Table 7.5

Comparability of Groups on Demographic Characteristics for Salt Lake City Age-at-Start Study

	Active Subjects Enrolled by June 1, 1989								Subjects Included in 18 Month Analyses								Subjects Included in 30 Month Analyses							
	Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES$	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES$	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES$
• Age of child in months as of 7/1/89	37.3	(10.7)	31	36.8	(1.28)	27	.87	-.04	39.0	(8.9)	29	40.9	(8.3)	23	.43	+.22	42.8	(6.0)	21	43.4	(6.6)	19	.75	+.10
• Age of mother in years	28.5	(4.9)	31	30.8	(5.3)	27	.08	|.45|	28.6	(5.0)	29	30.8	(5.7)	23	.14	|.41|	28.7	(4.8)	21	31.2	(5.8)	19	.16	|.47|
• Age of father in years	30.7	(5.7)	31	32.9	(5)	26	.14	|.41|	30.6	(5.8)	29	33.2	(5.0)	22	.09	|.48|	30.5	(6.0)	21	33.6	(4.7)	18	.08	|.57|
• Percent male *	52		31	41		27	.42	|.25|	52.0		29	39.0		23	.37	|.29|	48.0		21	42.0		19	.73	|-.12|
• Years of education for mother ∞	12.9	(2.3)	31	13.4	(1.9)	27	.34	+.24	12.9	(2.2)	29	13.3	(2.0)	23	.58	+.19	12.9	(2.3)	21	13.5	(2.1)	19	.42	+.27
• Years of education for father ∞	13.1	(2.3)	31	14.8	(1.7)	26	.01	+.84	13.0	(2.3)	29	14.7	(1.7)	22	.01	+.83	13.1	(2.5)	21	14.9	(1.7)	18	.01	+.84
• Percent with both parents living at home	100	(1.52)	31	93		27	+	-.62	100.0		29	91.0		23	.11	-.68	100.0		21	95.0		19	.29	-.40
• Percent of children who are caucasian *	84		31	96		27	.11	+.58	83.0		29	96.0		23	.15	-.54	86.0		21	95.0		19	.34	+.37
• Hours per week mother employed ∞	10.3	(17.7)	31	9.5	(14)	27	.86	|-.05|	11.0	(18.1)	29	9.2	(14.4)	23	.69	|-.11|	11.4	(18.7)	21	10.7	(15.3)	19	.89	|-.04|
• Hours per week father employed ∞	42.4	(13.9)	31	41.7	(17.1)	23	.88	|-.05|	43.8	(11.6)	26	44.7	(15.7)	19	.81	|.07|	43.3	(10.6)	18	42.5	(14.3)	16	.85	|.06|
• Percent of mothers employed as technical managerial or above *	23		31	11		27	.26	-.36	24.0		29	13.0		23	.31	-.32	24.0		21	16.0		19	.53	-.22
• Percent of fathers employed as technical managerial or above *	19		31	50		26	.01	+.77	21.0		29	55.0		22	.01	+.83	24.0		21	56.0		18	.04	+.75
• Total household income Δ	$23,709	(17,019)	31	$30,796	(17,782)	27	.07	+.49	$24,414	(17,357)	29	$32,065	(18,488)	23	.13	+.52	$25,381	(15,615)	21	$33,421	(18,785)	19	.15	+.50
• Percent receiving public assistance ∞	26		31	26		27	.99	0	24.0		29	26.0		23	.87	+.06	29.0		21	26.0		19	.87	+.05
• Percent of children in day care more than 5 hours per week * ∞	39		31	19		26	.11	+.50	41.0		29	23.0		22	.16	+.45	43.0		21	28.0		18	.33	+.35
• Number of siblings ∞	1.2	(1.0)	31	1.6	(1.7)	27	.29	|.30|	1.2	(1.0)	29	1.7	(1.8)	23	.26	|.37|	1.3	(1.1)	21	1.5	(1.7)	19	.76	|.14|
• Percent with English as primary language +	100		31	100		27	+	0	100.0		29	100.0		23	—	0	100.0		21	100.0		19	—	0
							$\bar{X}$ ES = +.22								$\bar{X}$ ES = .24								$\bar{X}$ ES = .24	

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* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Δ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

+ One of the groups has no variance.

∞ Some posttest information was used to arrive at these figures.

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statistically significant differences on two, and when the data are considered in total, it appears that the groups are very comparable in terms of demographics. The slight advantages which may exist are in favor of the group which received early intervention.

A comparison of the infants' medical characteristics (see Table 7.6) indicated that at pretest, the groups were similar on most medical characteristics. However, infants in the early intervention group were of significantly lower birthweight and gestational ages, demonstrated a higher incidence of bronchopulmonary dysplasia, and received significantly more postnatal transfusions than infants in the delayed intervention group. Although there is a slight advantage for the early intervention group on other demographic variables, there is a fairly substantial advantage for the delayed intervention group with respect to medical variables. This will be controlled for by using analysis of covariance procedures in the final analysis.

Table 7.7 shows infant pretest scores on the BDI and family functioning measures. The groups were similar on the personal-social, adaptive, and cognitive domain scores of the Battelle and on the Battelle total scores. However, they differed significantly on the Battelle motor and communication domain scores, with the early intervention group receiving the higher scores. Thus, although the early intervention group was smaller and sicker at pretest, they scored slightly higher on the measure of child functioning at pretest. The difference between groups on the Discrepancy scores of the FACES revealed that families in the delayed intervention group tended to be less satisfied with their family functioning when compared to families in the early intervention group. There were insufficient data to analyze differences between groups on the FACES III, FRS, FSS, and FILE for only those subjects posttested at 30 months CCA.

Table 7.6

Comparability of Groups on Medical Characteristics for Salt Lake City Age-at-Start Study

Variable	Active Subjects Enrolled By June 1, 1989								Subjects Included in Posttest #1 Analyses								Subjects Included in Posttest #2 Analyses							
	Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES$^{\$}$	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES$^{\$}$	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES$^{\$}$
Birthweight (gms)$^{\Delta}$	1608	(693)	31	11090	(439)	27	.01	-.73	1,627	(712.0)	29	1,216	(470.0)	23	.02	-.68	1,583	(740.0)	21	1,169	(473.0)	19	.04	-.68
Grade of IVH * (percent with grade III or IV)	35		31	33		27	.87	+.05	38		29	30		23	.57	+.18	52		21	37		19	.32	+.35
Gestational Age (Wks)$^{\Delta}$	30	(3.5)	31	28	(2.5)	27	.01	-.66	31.1	(3.6)	29	29.2	(26.0)	23	.04	-.60	30.9	(3.8)	21	29.0	(2.7)	19	.08	-.58
1-Minute Apgar	4.0	(2.5)	31	3.7	(2.4)	26	.68	-.12	4.0	(2.5)	29	3.9	(2.5)	22	.85	-.04	4.1	(2.5)	21	3.9	(2.6)	18	.80	-.08
5-Minute Apgar	6.2	(2.0)	31	6.1	(1.6)	26	.92	-.06	6.1	(2.0)	29	6.1	(1.6)	22	.95	0	5.9	(2.3)	21	5.9	(1.6)	18	.98	0
Apnea (%)*	55		31	70		27	.23	-.38	52		29	65		23	.33	-.52	57		21	58		19	.96	-.02
Seizures (%)*	10		31	15		27	.56	-.20	10		29	17		23	.46	-.26	14		21	21		19	.57	-.21
Respiratory Distress Syndrome (%)*	6		31	15		27	.32	-.34	7		29	17		23	.24	-.41	5		21	16		19	.25	-.42
Bronchopulmonary Dysplaysia (%)*	55		31	78		27	.07	-.59	55		29	83		23	.04	-.72	57		21	84		19	.06	-.71
Metabolic Acidosis (%)*	16		31	22		27	.56	-.19	14		29	17		23	.72	-.13	0		21	16		19	.06	-.70
Retinopathy of Prematurity (%)*	23		31	37		27	.24	-.38	24		29	35		23	.40	-.28	29		21	37		19	.58	-.20
Hypertension (%)*	3		31	11		27	.26	-.38	3		29	9		23	.42	-.28	5		21	11		19	.49	-.25
Number of postnatal transfusions	7.6	(7.7)	31	11.6	(10.6)	27	.11	-.44	8.0	(7.8)	29	12.4	(11.0)	23	.09	-.48	9.3	(8.5)	21	14.3	(11.2)	19	.12	-.51
							$\bar{X}$ ES = -.34								$\bar{X}$ ES = -.32								$\bar{X}$ ES = -.31	

*Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those who did not possess the trait were scored "0."

$^{\Delta}$Statistical analyses for these variables were based on a t-test. Medians are used in the table as best representing central tendency.

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Table 7.7

Comparability of Groups on Pretest Measures
for SLC/IVH Age-at-Start Study

Variable	Active Subjects Enrolled by June 1, 1989										Subjects Included in Posttest #1 Analysis										Subjects Included in Posttest #2 Analysis									
	Delayed Intervention				Early Intervention						Delayed Intervention				Early Intervention						Delayed Intervention				Early Intervention					
	X̲	(SD)	%ile	n	X̲	(SD	%ile	n	P Value	ES$	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	ES$	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	ES$
• Age in months at Pretest	3.4	(7.2)		31	3.3	(.53)		27	.45	-.16	3.4	(0.7)		29	3.3	(0.6)		23	.54	-.15	3.2	(0.5)		21	3.3	(0.6)		19	.47	.18
• Battelle Developmental Inventory (BDI)+																														
DQs for:																														
Personal Social	104	(52)		31	120	(27)		27	.56	.40	99.0	(46.0)		29	112.0	(53.0)		23	.73	.26	94.0	(51.0)		21	105.0	(52.0)		19	.51	.00
Adaptive Behavior	86	(49)		31	97	(44)		27	.50	.24	82.0	(45.0)		29	91.0	(45.0)		23	.79	.16	77.0	(51.0)		21	87.0	(48.0)		19	.48	.20
Motor	82	(25)		31	96	(16)		27	.01	.67	80.0	(22.0)		29	94.0	(15.0)		23	.02	.74	84.0	(24.0)		21	94.0	(16.0)		19	.02	.50
Communication	83	(50)		31	104	(31)		27	.04	.51	79.0	(47.0)		29	104.0	(33.0)		23	.03	.61	81.0	(53.0)		21	107.0	(34.0)		19	.03	.59
Cognitive	79	(46)		31	85	(39)		27	.67	.14	79.0	(47.0)		29	85.0	(38.0)		23	.67	.14	81.0	(52.0)		21	95.0	(35.0)		19	.20	.18
TOTAL	87	(42)		31	104	(33)		27	.15	.48	84.0	(41.0)		29	99.0	(33.0)		23	.25	.40	83.0	(47.0)		21	98.0	(35.0)		19	.12	.36
• Parenting Stress Index (PSI)#@																														
Child Related (range 47 to 235)	106	(21)	67	23	101	(20)	57	23	.43	.24	106.0	(22.0)	67	21	102.0	(21.0)	60	19	.53	.19	107.0	(24.0)	70	13	103.0	(22.0)	61	15	.61	.17
Other Related (range 54 to 270)	131	(30)	68	23	126	(19)	60	23	.46	.20	133.0	(30.0)	71	21	127.0	(18.0)	61	19	.51	.25	132.0	(32.0)	70	13	126.0	(17.0)	60	15	.54	.25
TOTAL (range 101 to 505)	237	(41)	68	23	227	(35)	59	23	.36	.26	239.0	(41.0)	70	21	229.0	(35.0)	61	19	.44	.18	239.0	(46.0)	70	13	228.0	(35.0)	60	15	.49	-.27
• Family Adaptation and Cohesion Evaluation Scales (FACES)# *																														
Adaptation (range 0 to 26)	4.6	(3.2)		10	6.5	(3.9)		12	.22	-.53	4.6	(3.3)		8	5.7	(3.0)		8	.49	-.35	4.2	(.0)		1	4.3	(1.8)		4		-.07
Cohesion (range 0 to 30)	3.9	(1.5)		10	4.8	(2.7)		12	.34	-.42	3.7	(1.7)		8	4.4	(2.8)		8	.56	-.31	4.1	(.0)		1	4.5	(1.9)		4		-.26
TOTAL (range 0 to 40)	6.6	(2.1)		10	8.5	(3.9)		12	.17	-.62	6.5	(2.1)		8	7.5	(3.4)		8	.50	-.36	5.9	(.0)		1	6.3	(2.1)		4		-.24
Discrepancy (range 0 to 80)	16.7	(11.2)		10	10.1	(3.6)		12	.07	.94	18.0	(12.3)		8	11.5	(3)		8	.19	.85	15.0	(.0)		1	11.0	(2.4)		4		2.08
•Family Resource Scale (FRS)%&	117	(15)	48	10	125	(17)	63	12	.30	.50	118.0	(15.0)	50	8	125.0	(21.0)	63	8	.48	.39	111.0		37	1	131.0	(17.0)	73	4		1.47
• Family Support Scale (FSS)%&	30.9	(10)	63	10	37.3	(13.5)	78	9	.25	.55	30.6	(10.2)	63	8	32.7	(11.3)	69	7	.71	.20	27.0		48	1	35.8	(7.7)	76	4		1.43
• Family Index of Life Events (FILE) **#	13.5	(10.9)	20	10	13.9	(5.7)	20	12	.92	-.05	14.3	(12.1)	20	8	11.8	(5.1)	29	8	.60	.29	13.0		24	1	11.3	(3.9)	34	4		.54 X̄ ES = .38

+ Statistical Analyses for BDI Scores were conducted using computed scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age equivalent"(AE) score reported in the technical manual for each child's raw score by the child's chronological ageat time of testing.

# Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

%No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped childen).

&Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

** A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

@A low raw score and/or a low percentile score indicates lower stress level.

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance form "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental group scored closer to "ideal."

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Analysis of covariance procedures were used to measure differences between groups on measures of child and family functioning following early intervention services to one group of infants and delayed intervention to another group. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. For example, gestational age, pretest Battelle Motor raw scores, and the presence or absence of hypernatremia were used as covariates for 30-month Battelle Personal-Social raw scores. The combination of these variables reduced the amount of unexplained variance in the 30-month Battelle Personal Social raw scores better than other combinations of pretest and demographic variables.

In each analysis, the specific covariates used are indicated in the table. ANCOVA results are shown in Table 7.8. The analysis of data collected at both 18 months CCA and 30 months CCA indicated that there were no statistically significant differences between groups on measures of child functioning.

Table 7.8

Summary of ANCOVA's on Measures of Child Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

Variable	18 Month Analyses: Covariates in Order	Delayed $\bar{X}$	Delayed (SD)	Delayed Adj. $\bar{X}$	Delayed n	Early $\bar{X}$	Early (SD)	Early Adj. $\bar{X}$	Early n	ANCOVA F	p Value	ES[3]	30 Month Analyses: Covariates in order	Delayed $\bar{X}$	Delayed (SD)	Delayed Adj. $\bar{X}$	Delayed n	Early $\bar{X}$	Early (SD)	Early Adj. $\bar{X}$	Early n	ANCOVA F	P Value	ES[3]
Age in months at Posttest	----	18.8	1.4	—	29	18.4	0.8	---	23	1.52	.22	*****		30.8	1.5		21	30.8	1.5		19	0.03	.87	*****
Battelle Developmental Inventory (BDI) +																								
Personal Social	1,5,6,7	81.6	24	79.4	29	89.1	30	91.3	23	2.27	.14	+0.50	4,1,11	82.4	24	80.1	21	88.5	32	90.3	19	0.98	.33	+0.43
Adaptive Behavior	1,5,6,8,9	87.7	23	86.0	29	90.1	25	91.8	23	0.20	.66	+0.25	1,4	80.7	2.7	81.1	21	88.9	36	88.4	19	0.15	.70	+0.27
Motor	5,1,3,4	84.8	29	83.4	29	86.3	27	87.0	23	0.10	.75	+0.14	5,1,3,6	79.7	26	82.0	21	80.4	28	78.1	19	0.23	.63	-0.15
Communication	5,1,6,10,9	83.3	23	81.2	29	87.4	24	89.5	23	1.50	.22	+0.36	5,1,6	74.7	21	75.3	21	79.5	25	78.9	19	0.13	.72	+0.17
Cognitive	1,5,6	81.5	22	80.4	29	81.8	22	82.9	23	0.90	.97	+0.11	1,5	74.7	25	76.6	21	76.1	24	74.2	19	0.05	.82	-0.10
TOTAL	1,5,6	85.7	21	84.6	29	89.7	24	90.8	23	0.45	.50	+0.30	1,5	78.5	21	79.4	21	82.9	26	82.0	19	0.02	.88	+0.12
Motor Sequence	—	133.5	74.7		12	142.3	56.5		15		.74	+.14												
Rating of Child's Health$^{\Delta}$	—	1.75	.44	—	20	2.0	.61	—	17	2.06	.16	.48		1.79	.54		19	2.11	.68		18	2.59	.12	.53
											$\bar{X}$ ES = +.39												$\bar{X}$ ES = +.32	

+ BDI Statistical Analyses for BDI Scores were conducted using computed scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age equivalent" (AF) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Effect size (ES) is defined here as the difference between the groups (Early minus Delayed) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Covariates: 1 = Battelle Raw pretest Communication Score *; 2 = Battelle Raw pretest Motor Score *; 3 = IVH severity *; 4 = Gestational Age *; 5 = Number of transfusions in NICU *; 6 = Battelle Raw pretest Personal-Social Score; 7 = Pneumonia *; 8 = Respiratory Distress Syndrome; 9 = Pneumothorax; 10 = Mothers with technical/professional occupation; 11= Hypernatremia.

* variables for which there are pretest differences

$^{\Delta}$ Parents rated their child's health on a 3 point scale (1=worse than peers, 2=same as peers, 3=better than peers).

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Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 7.9 presents the results of the ANCOVA comparisons of posttest measures of family functioning. Results of the ANCOVA indicated no significant differences between the early and delayed intervention groups on outcome measures of family functioning at either 18 months corrected age or 30 months corrected age

Conclusions

Although the Salt Lake City IVH study has reached maximum enrollment, all of the children pretested are not yet posttested, and the results presented here are preliminary. However, some conclusions can be drawn with regard to the differences between groups at pretest and to child and family outcomes following early or delayed interventions.

The fact that children in the two groups differed on key medical variables is balanced to some degree by the fact that there are differences in the opposite direction for some of the pretest developmental variables. It was concluded that the groups were basically comparable and important differences were accounted for by using analysis of covariance in the outcome analyses.

The results of the statistical analysis of both the 18- and 30-month Posttest data indicated that there were no significant differences between groups on the measures of child or family functioning following intervention begun at 3 months versus intervention begun at 18 months corrected chronological age.

The preliminary conclusion from this study, however, was that to this date the earlier intervention has not resulted in benefits to either children or families. Even when the initial differences were accounted for, those children who received earlier intervention did not appear to do substantially better than children who received the later intervention.

Table 7.9

Summary of ANCOVA's on Measures of Family Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

Variable	Covariates & in Order[#]	Intervention Group X̄	Intervention Group (SD)	Intervention Group Adj. X̄	Intervention Group %ile	Intervention Group n	Expanded Intervention Group X̄	Expanded Intervention Group (SD)	Expanded Intervention Group Adj. X̄	Expanded Intervention Group %ile	Expanded Intervention Group n	ANCOVA F	p Value	ES[$]	Covariates &	Intervention Group X̄	Intervention Group (SD)	Intervention Group Adj. X̄	Intervention Group %ile	Intervention Group n	Expanded Intervention Group X̄	Expanded Intervention Group (SD)	Expanded Intervention Group Adj. X̄	Expanded Intervention Group %ile	Expanded Intervention Group n	ANCOVA F	p Value	ES[$]
Parenting Stress Index (PSI)[$#@]																												
Child Related (range 47 to 235)	6,2,3	102	(13)	101	57	29	102	(16)	102	60	21	0.00	.96	0.00	6	104	(15)	105	65	20	104	(20)	104	64	19	0.06	.80	+0.07
Other Related (range 54 to 270)	5,3,6,7	123	(26)	119	46	29	124	(25)	129	65	21	2.29	.14	-0.38	5,7,6	124	(22)	124	56	20	119	(22)	119	46	19	0.64	.43	+0.23
TOTAL (range 101 to 505)	1,6,3	225	(34)	221	50	29	225	(34)	230	62	21	0.93	.34	-0.26	5,6,7	227	(34)	229	61	20	238	(36)	221	50	19	0.42	.52	+0.24
Family Adaptation and Cohesion Evaluation Scales (FACES)[$*#]																												
Adaptation (range 0 to 26)	3	3.8	(3.7)	3.8		29	3.8	(2.6)	3.7		21	0.00	.95	+0.03	7,1	5.3	(3.9)	5.8		20	4.8	(3.3)	4.3		19	1.76	.19	+0.38
Cohesion (range 0 to 30)	2	3.9	(3.4)	3.9		29	3.7	(2.2)	3.7		21	0.13	.72	+0.06	7,6	4.2	(2.9)	4.8		20	4.8	(4.5)	4.1		19	0.38	.54	+0.24
TOTAL (range 0 to 40)	2	5.9	(4.5)	6.0		29	5.8	(2.4)	5.8		21	0.06	.81	+0.04	7,6	7.3	(4.0)	8.0		20	7.3	(4.8)	6.5		19	1.24	.27	+0.38
Discrepancy (range 0 to 80)	2	10.9	(8.2)	10.9		28	10.9	(5.9)	10.9		21	0.00	.98	0.00	7,6	7.6	(7.2)	8.1		20	9.1	(6.2)	8.6		19	0.05	.83	-0.07
Family Resource Scale (FRS)[$%&]	1,5	122	(18)	124	61	29	128	(14)	128	68	21	0.18	.68	+0.22	1,7,2	122	(21)	122	57	20	127	(17)	128	68	19	1.39	.25	+0.29
Family Support Scale (PSS)[$%&]	2,4	28	(8)	285	52	29	32.7	(12.7)	32.2	66	21	1.35	.25	+0.46	6	29.9	(10)	29.4	55	20	32.5	(10.5)	33.0	69	19	1.29	.26	+0.36
Family Index of Life Events (FILE)[$~]	1,4	11.5	(6.3)	11.1	34	29	11	(7)	11.3	33	21	0.01	.91	-0.03	1,7,4,6	8.9	(5.2)	9.4	44	20	10.2	(6.8)	9.7	42	18	0.03	.86	-0.06
														X̄ ES = .09														X̄ ES = .24

[$] Effect size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[~] A low raw score and/or high percentile score indicates lower stess level, and a positive effect size is more desirable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental group scored closer to "ideal."

Covariates: 1 = Income; 2 = Receives public assistance; 3 = Father's age; 4 = Years of Father's education; 5 = Mother's age; 6 = Hypernatremia; 7 = Metabolic Acidosis.

The results of the current study present a contrast to results reported by Als et al. (1986) and Resnick et al. (1987; 1988) who found significant differences favoring infants receiving early intervention services. This study did, however, offer preliminary support and can be better compared to the findings of Piper (1986) and Palmer (1988), who concluded that early motor therapy did not substantially improve the developmental outcome of high-risk infants. It is possible that focusing early intervention efforts on sensory motor development is less effective than addressing more general developmental issues. It is also possible that differences between treatment groups will not be apparent until the subjects in this study are older. For example, Rauh et al. (1988) found that significant differences between experimental and control groups did not appear until 36 and 48 months, and Bennett (1987) reported that some less obvious handicaps were not apparent in children biologically at-risk for handicapping conditions until they reached school age.

Future Plans

The SLC/IVH project will continue to provide intervention services and to monitor the progress of all children in the early intervention group and to children in the delayed intervention group who have reached 18 months corrected age. Services will continue to be provided on an individualized basis, and children will be referred to community agencies as necessary to facilitate their developmental progress. Children will be assessed annually until they are 54 months.

Plans for the future also include continuing to analyze costs and benefits of early intervention programs with infants at-risk for handicaps, such as this IVH population. With appropriate data, a comparison can be made regarding costs and benefits of each intervention phase of this study.

CHARLESTON, SOUTH CAROLINA IVH PROJECT

Project #8

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age versus services at 12 months.

LOCAL CONTACT PERSON: Conway Saylor, Ph.D.; Medical University of South Carolina

EIRI COORDINATOR: Lee Huntington, Ph.D.

LOCATION: Charleston, South Carolina

DATE OF REPORT: 10-9-89

Rationale for the Study

One of the major determinants of infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).

Forty percent of low birthweight infants (or approximately 90,000 infants) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade

I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile, Burstein, Burstein, & Koffler, 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is limited and controversial (Hynd et al., 1984). Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Stage I and II LBW infants exhibited moderate handicapping conditions by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these handicaps. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe handicapping conditions, such as cerebral palsy, by the third year of life. Sostek, Smith, Katz, and Grant (1987) demonstrated that the severity of IVH did not predict the infant's developmental progress at 2-years of age, however 40% of the infants in that study showed significant delays at 2 years. Finally, Bozynski et al. (1984) indicated that these infants are at especially high risk for later motor problems.

Although there is a fair amount of research on interventions for premature low-birth-weight babies (see Bennett, 1987; Casto, et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey, Bryant, Sparling, & Wasik, 1984; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH.

Two recent studies examined the effectiveness of early sensory motor therapy for infants at-risk for developmental delays. Goodman et al. (1985) divided infants into high and low risk for motor problems based on an early assessment, and alternately assigned them to control and intervention groups. A program of weekly home visits began for the intervention group at three months of age. The results of this study indicated that the intervention group did not benefit from the intensive intervention. One methodological flaw with this study that was not clearly discussed in the report was the fact that infants in the control group who started to develop motor problems were removed from the control group and given intervention. This protocol might have resulted in those infants who could have demonstrated the efficacy of the intervention being removed from the analyses.

Palmer et al. (1988) randomly assigned 48 infants with mild and severe spastic diplegia to groups receiving either 12 months of physical therapy or 6 months of infant stimulation followed by 6 months of physical therapy. After 6 months of therapy, the infants in the physical therapy group had lower mean motor scores and were less likely to walk. These differences persisted after 12 months of therapy. In addition, there were no significant differences in the number of infants with contractures or needing bracing, and the physical therapy group had lower mental development scores. The major difference between this study and the current study is the enrollment of children who already show motor problems, rather than those at risk for development of these problems.

Overview of Study

Intervention programs for low-birthweight infants have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH (for reviews see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey, Bryant, Sparling, & Wasik, 1984). At issue for this study are the effects and related costs of beginning intervention at different ages for infants who have serious medical problems and who routinely spend up to three months in intensive care units.

The specific comparison for this study was between early, intensive motor-development oriented intervention and later, comprehensive developmental services. This comparison was chosen because a high proportion of the developmental problems encountered by these infants are motor development related. Since these infants routinely receive only medical follow-up until a particular problem or delay is noted, this study provided a good opportunity to test the age-at-start hypothesis.

Methods

This study was implemented in collaboration with the Departments of Pediatrics and Psychiatry of the Medical University of South Carolina in Charleston, South Carolina. The full-time staff of this intervention project consisted of a home interventionist and two physical therapists. The project was overseen on a part-time basis by a director and supported on a part-time basis by a coordinator and a secretary.

Subjects

The sample as of July 1, 1989 was composed of 68 infants actively in the project, from both urban and rural areas around Charleston. Subject recruitment was closed in October, 1988. Sixty-eight infants have been pretested, 56 infants have had their one-year posttest and 30 have had their two-year posttest. Eleven infants are still in the first phase of intervention and have not received their one-year posttest.

Recruitment. Infants qualified for participation in the research if they had been patients in the NICU at the Medical University of South Carolina, if they had experienced perinatal intraventricular hemorrhage (IVH) or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment (60 mile radius). Severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories. Birthweights were categorized as less than or equal to 1000 g and greater than 1000 g.

Subjects who met the inclusion criteria were identified while in the NICU. Parents of eligible infants were contacted while the infant was still in the NICU and subsequent telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions depending upon where they were placed by random assignment. Infants with IVH were randomly assigned to treatment or control conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1000 g or over 1000 g). Those infants who had birthweights under 1000 g but did not have IVH were stratified by the number of days that they required ventilator assistance (less than 7 days versus seven days or more). Stratification was used to ensure that the groups were balanced on the severity of complication that the infants faced. Parents were informed of their infant's assignment after they give approval to participate in the study.

The only people at the site who knew the actual order of eligibility and enrollment of subjects were the site coordinators. The dates on which infants were born were the basis for sequence of enrollment, and infants were assigned to experimental conditions in order of eligibility.

A total of 74 subjects were enrolled in this project. Of these, three infants (4%) moved to areas inaccessible to the project. One (1%) disappeared, giving the project no notice or address, and two (3%) infants died. Thus, 92% of the infants enrolled were still in the program as of July 1, 1989.

Demographic Characteristics. Children were enrolled in this study in two cohorts. There are currently 68 children between 3 and 35 months of age enrolled in the study. The first 19 children were enrolled before the full battery of pretest measures was finalized. Therefore the pretest for these children consisted only of the Battelle Developmental Inventory (BDI). The next 49 children were enrolled after the full testing battery (described below) had been developed. Thirty-five (63%) of the infants who have reached the first posttest received the full assessment battery at pretest.

Table 8.1 represents the available demographic data for these infants, and is divided into two sections. The left side of the table includes the 68 infants who are currently active subjects of the research. The right side includes the 56 infants who have received their first posttest. All of the children were from families who reside in the metropolitan area of Charleston, South Carolina. The ethnic background of the sample was approximately 60% Black and 33% Caucasian. All of the participants live in homes where English is the primary language, and there were slightly more two parent than single parent families (57% vs 43%). Forty percent of the enrolled families were receiving public assistance. Only one variable differed significantly between the early and delayed intervention groups. There was a higher proportion of males in the delayed intervention group than in the early intervention group (67% versus 31%, respectively).

Table 8.2 represents the medical demographic data of the early and delayed intervention groups. The left hand data is for all active subjects enrolled by July 1, 1988, and the right is for those infants included in this years posttest analyses. There were no differences between the groups in either the overall sample or those infants used for the first posttest analyses.

Table 8.1

Comparability of Groups on Demographic Characteristics for South Carolina Age-at-Start Study

Variable	Active Subjects Enrolled By July 1, 1989 (n=68)							Subjects Used in First Posttest Analyses (n=56)						
	Delayed Intervention			Early Intervention			P Value	Delayed Intervention			Early Intervention			P Value
	X̄	(SD)	n	X̄	(SD)	n		X̄	(SD)	n	X̄	(SD)	n	
• Age of child in months as of 7/1/89	29.0	(11.6)	32	26.3	(11.2)	36	.32	31.7	(10.5)	27	28.6	(10.9)	29	.27
• Age of mother in years	29	(7.0)	31	28	(6.1)	36	.47	28	(7.3)	26	29	(6.0)	29	.87
• Age of father in years	31	(6.6)	31	31	(6.3)	31	.74	31	(6.7)	26	32	(6.4)	26	.39
• Percent male*	31		32	67		36	.003	33		27	72		29	.003
• Years of education for mother	12.8	(2.0)	25	12.4	(2.0)	33	.41	12.6	(2.0)	20	12.5	(2.2)	26	.98
• Years of education for father	12.6	(2.0)	23	12.5	(1.9)	30	.86	12.3	(2.0)	18	12.6	(2.1)	24	.65
• Percent with both* parents living at home	56		25	58		33	.91	55		20	65		26	.49
• Percent of children who are caucasian*	34		32	33		36	.93	33		27	30		29	.72
• Hours per week mother employed	20	(19.1)	24	18	(19.1)	29	.70	16	(19.7)	19	20	(19.3)	24	.53
• Hours per week father employed	40	(12.7)	20	43	(14.3)	23	.38	40	(14.7)	15	43	(15.2)	19	.54
• Percent of mothers employed as technical managerial or above*	9		23	6		32	.74	0		18	8		25	.62
• Percent of fathers employed as technical managerial or above*	16		18	4		24	.22	7		14	5		19	.83
• Total household income	19,340	(20,022)	25	14,354	(11,868)	31	.28	13,950	(11,872)	20	16,167	(12,626)	24	.55
• Percent receiving public assistance*	42		24	43		20	.93	47		19	32		22	.32
• Percent with mother as primary caregiver*	62		32	50		36	.10	59		27	76		29	.19
• Percent of children in day care more than 5 hours per week*	50		24	21		29	.03	30		19	22		22	.34
• Number of siblings	1.4	(1.8)	24	1.2	(1.5)	33	.48	1.7	(1.9)	19	1.0	(1.4)	26	.22
• Percent with English as primary language*	100			100			1.00	100			100			1.00

*Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored as "0."

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Table 8.2

Comparability of Groups on Medical Characteristics
for South Carolina Age-at-Start Study

	Active Subjects Enrolled By July 1, 1989 (n=68)							Subjects Included in First Posttest Analyses (n=56)						
	Delayed Intervention			Early Intervention				Delayed Intervention			Early Intervention			
Variable	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	P Value	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	P Value
Birthweight (gms)+	1,138	(356.6)	32	1,099	(363.3)	35	.60	1,144	(362.3)	27	.113	(380.7)	29	.54
Grade of IVH * (percent with grade III or IV)	47		32	61		36	.25	48		27	58		29	.44
Very Low Birthweight * (Percent VLBW, no IVH)	16		32	11		36	.59	15		27	14		29	.91
Gestational Age (Wks)	30	(2.7)	32	29	(2.5)	36	.20	30	(2.7)	27	29	(2.8)	29	.20
Days on Ventilator	16	(23.7)	32	18	(18.7)	36	.71	16	(25.0)	27	19	(19.8)	29	.61
Apnea (%)*	44		32	53		36	.46	44		27	52		29	.59
Seizures (%)*	6		32	14		36	.30	7		27	17		29	.27
Respiratory Distress Syndrome (%)*	69		32	80		36	.27	63		27	83		29	.10
Bronchopulmonary Dysplaysia (%)*	34		32	36		36	.88	33		27	38		29	.72
Retinopathy of Prematurity (%)*	38		32	54		36	.14	30		27	45		29	.25

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those who did not possess the trait were scored "0."

+ The birthweight is missing for one infant who was born at a separate hospital and transported to the participating hospital.

Alternative Intervention Programs

The comparison for this study was of an early versus delayed intervention program. Intervention occurred in two phases. During Phase I, the subjects assigned to the early intervention group received a sensorimotor intervention beginning when the infants were 3 months of age and the delayed intervention group received the routine medical follow-up services available to the community in general. In Phase II, the delayed intervention phase, all infants received home intervention services and sensorimotor services as needed, and parents and infants participated in an all infants who were in Neonatal Intensive Care Units were referred to the South Carolina State Department of Health Neonatal Follow-up Clinic and received routine medical follow-up from private physicians or clinics. Previous funding for these services was provided by the South Carolina Department of Health, for those utilizing the follow-up service, or by patient self-pay for those using private physicians or clinics. These services remain the standard level of care for all infants in the treatment area. Control group subjects typically received no other services during the first phase of the study, as very few services were available. However, parents were able to access services in the community if they desired. Parents were queried about services they have accessed during the time period of the study.

During both the early and delayed phases of the intervention project, a primary tool of the intervention was the Curriculum and Monitoring System (CAMS) (Casto, 1979). The Curriculum and Monitoring Systems (CAMS) was designed to meet the educational needs of young handicapped children served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the curriculum programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or an institutional/school setting.

The CAMS is designed to stimulate optimal development by programs in five areas: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development. The delayed intervention offers the other four domains of the CAMS in addition to the motor domain that was offered during the early intervention.

The *Receptive Language Program* teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The *Expressive Language Program* teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The *Motor Program* is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The *Self-Help Program* is designed to teach basic skills for self care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The *Social-Emotional Program* is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The program, which is sequenced developmentally, begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

Early Intervention Program

Between 3 and 12 months corrected age, subjects in the Early Intervention group were scheduled for twice-monthly one-hour sessions with the physical therapist. The therapist worked with the infant and parents using the Motor Program of the CAMS (Casto, 1979). First, a placement test was administered in the motor skills domain to determine which objectives should be offered to the child. Second, curriculum books were provided with developmentally sequenced objectives and activities for assisting in a child's gross and fine motor development for ages birth to 5 years of age.

A typical intervention session was conducted by a therapist who worked with the child, with the parent present. The physical therapist also instructed the parent on exercises that the child could do at home, and the parent practiced and demonstrated competence on the exercises before beginning home intervention. The parents were requested to work with the child at home for at least 20 minutes per day, 5 days per week, on techniques they learned in the intervention sessions. The physical therapist telephoned the parent on weeks they did not meet to answer questions and provide guidance on implementation of intervention techniques. Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes and the motor program placement test checklist were updated as goals were met.

Delayed Intervention Program

At 12 months corrected age, all subjects, Early and Delayed Intervention groups, began expanded intervention programs utilizing all five domains of the CAMS programs. A child development specialist administered the CAMS placement tests, determined developmental levels, and set appropriate goals for intervention in each domain. All subjects were given placement tests in motor, social-emotional, self-help, receptive language, and expressive language domains and then participated in an expanded intervention program, which included weekly contacts with an infant specialist. The interventionist alternated twice monthly home visits with telephone contacts and encouraged parents to attend monthly center based sessions for parent-infant dyads.

The child development specialist was scheduled to meet with the parent and child for one-hour twice each month and provided intervention. For each session, an objective was determined for the child, the child development specialist modeled the training for the parent, and the parent demonstrated the technique. The parent was asked to spend 20 minutes each day, 5 days each week providing similar intervention with their child at home. The child development specialist called the parent via telephone weekly between clinic appointments to check on progress and answer questions. When the child returned for the next session, the child development specialist had the parent elicit the new behavior from the child. If the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

For example, the objective for a child might be to point out facial features. The specialist would teach the parent an exercise to teach the child facial features. At the next meeting, the specialist would have the child point out facial features. If the child showed competence in that area, a new objective would be established. Some children would have objectives in several domains, others may have only one area of delay. Recommendations were also provided to parents regarding problems or concerns such as toileting or behavior problems of the child.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was be referred to the physical therapist for motor intervention. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received home intervention only. The physical therapist followed the same procedures outlined in the early intervention service section.

Treatment Verification. White et al. (1987) discussed two important issues in verifying that an early intervention program occurred as it was intended. First, the delivery of the intervention must be examined to ascertain that the program which is being delivered is the same as that which was described in the methodology of the proposal and reports. Second, the extent to which the infants and their parents received and participated in the program must be examined. The SC-IVH project implemented several procedures to verify that the intervention was implemented as intended.

The first treatment verification procedure was a formal site review, conducted annually. The SC-IVH site reviews were conducted on September 20-21, 1987, April 25, 1988. and June 1, 1989. The purpose of the site review was to collect information regarding the nature and quality of the early intervention services delivered at this site. Documentation of treatment implementation occurred to ascertain that the intervention services were provided as intended and that the project remained faithful to the research protocol. The site review was conducted according to procedures described in the Guide for Site Reviews of EIRI Research Sites, in the Treatment Verification Handbook for Research Sites (EIRI, 1987). The site was rated excellent on all aspects of the evaluation at all visits, except for implementation of Individualized Family Service Plans.

In addition to verifying that the intervention program continued to be implemented as originally intended, three methods were used to examine parental participation in the intervention. First, the interventionists tracked the number of center and home based visits that an infant attended during each month. Second, the interventionists asked the parents once a month to estimate the amount of time during the past week that they spent working with their infant on activities suggested by the interventionist. When the interventionist recorded this information, they also rated the parents accuracy of estimation. Finally, the interventionist were asked to rate the parents once a year on three aspects of their participation in the intervention program. The interventionists used three point scales (1 = low, 2 = average, and 3 = high) to rate the parents' attendance of scheduled appointments, their knowledge of the information that the intervention was designed to provide, and their support of the goals and methods of the intervention program. Table 8.3 represents the data from these treatment verification methods.

Table 8.3

Parent Participation in Phase I Early Intervention Services

	n	$\overline{X}$	(SD)	Range	Min	Max
Percent of Scheduled Visits Attended	29	64	(23)	1.03	17	120
Number of Hours/month working with Interventionist[#]	29	1.28	(.46)	2.06	.34	2.4
Number of Hours/week working with child on suggested activities (Parent Report)[∞]	16	2.2	(.71)	2.21	1.3	3.5
Interventionist' Rating[*] of Accuracy of Parents Time Report	16	2.3	(.6)	2	1	3
Interventionists' Rating of Quality of Parent Participation						
1 Attendance[*]	29	2.14	(.79)	2	1	3
2 Knowledge[*]	29	2.24	(.74)	2	1	3
3 Support[*]	29	2.17	(.76)	2	1	3

[#] Based on percentage of scheduled visits attended times 2 hours for completion of 100% of visits.

[*] 1 = Low, 2 = Average, 3 = High.

[∞] n is smaller because these measures were started after 1st cohort had completed intervention Phase I.

Cost of alternative interventions. The cost per child for the early intervention group (24 children) represents an accumulated cost of intervention from October 1986 to October 1988, the total program cost for two years and two phases of intervention as outlined under the intervention program description. The cost per child for the later intervention group represents the cost for services from the date these 14 children turned 12 months of age and services began until October 1988, the end of FY 1987-88. The cost per child in Year One is adjusted for inflation so that all figures are comparable in 1987-88 constant dollars.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group: in Year One, the total number of children receiving intervention was 24; in Year Two, 38 children (both treatment and control) were receiving services. As illustrated in Table 8.4, program costs included directed service and program and university administration, occupancy, equipment, transportation, materials and supplies, and telephone used for the respective groups.

Table 8.4

Cost Per Child for South Carolina IVH Site (1986-88)

Resources	Early Intervention (N = 24)	Delayed Intervention (N = 14)
Agency Resources		
Direct Service Personnel	$2,870	$1,116
Administration		
Program	1,517	705
University	1,312	585
Occupancy	272	92
Equipment	49	15
Transportation	549	406
Materials/Supplies	133	68
Telephone	65	33
Subtotal	$6,767	$3,020
Contributed Resources		
Parent Time	2,234	1,117
Others	14	
Subtotal	$2,248	$1,117
TOTAL	***$9,015***	***$4,137***

Direct service personnel costs included wages and benefits for the physical therapist and the interventionists. Each of these are pro-rated according to actual time spent on intervention-related activities. Program administrative costs include the pro-rated salaries and benefits for the psychologist, coordinator, interventionist, and secretary according to their time spent on administrative duties for the intervention. Research costs in this, and all other resource categories, naturally, are excluded. The university administrative cost is based on the university indirect rate for general, departmental, and sponsored projects administration (24%). Occupancy charges were calculated based on the university's rate per square foot for office space, utilities, maintenance, and insurance pro-rated according to program usage. Equipment costs include the cost of office furniture and intervention equipment. These costs are based on market replacement values for each item which are annualized at a rate which accounts for interest and depreciation and pro-rated according to program usage to determine the annual equipment cost. Agency transportation cost for home visits were calculated at $.21 per mile based on actual mileage. In addition, the project reimbursed several parents for bringing their child to the center for treatments in Year 2.

Because the program relies heavily on parent participation for both home visits and conducting intervention with their own child in the home, the opportunity cost of parent time was also included. These costs are presented as "contributed resources" on Table 8.4. Parent time includes time spent in (1) center and home visit sessions with either the physical therapist or the interventions, and (2) intervention activities recommended by the program for each parent and child at home. Parents spent an average of 121.2 hours per year in session with professionals and conducting intervention activities at home. Parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for full-time work for women in the U.S.

Thus, the children entering the program at 3 months adjusted age, and receiving two years of individualized intervention from both professionals and their professionally-trained parents, cost $9,015 per child while children entering the program later at 12 months cost $4,137, including the value of parent time. The cost per child for intervention in Year Two is less than Year One because of the greater emphasis on physical therapy in Year One which costs more than services from the interventionist. This served to reduce costs allowing the program to serve more children and further reduce the cost per child. Economic analyses relating costs to effects are pending.

Data Collection

Data were collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children who experienced intraventricular hemorrhage at birth and the unique experiences of their families.

A local diagnostician who was unaware of the group membership of children or the specific purposes of the study was hired to administer the pre- and posttest measures. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations is being performed, and data on the reliability of this diagnostician will be reported in the future.

Pretest. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants[1] were tested with the Battelle Developmental Inventory (BDI). At the same time the parents completed the Parenting Stress Index (PSI), an assessment of the stress perceived by the parents, the Family Support Scale (FSS), ameasure of the number of different sources of support available to families with young children, the Family Resource Scale (FRS), a measure of the different kinds of resources available, the Family Inventory of Life Events and Changes (FILE), and which assesses the life events and changes experienced by the family during the previous 12 months, and the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the cohesiveness and adaptability of the family. All test and questionnaire protocols were sent to the program coordinator for scoring and placement in a data file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the newborn.

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[1] *The first nineteen infants who were enrolled only received the Battelle Developmental Inventory at pretest.*

Posttest. Posttesting occurred first at 12 months corrected age and annually thereafter. The posttest battery was administered by the same diagnostician who is "blind" to the subject's group assignment. The child was given the BDI and the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent demographic survey. Additional measures taken at 12 months corrected age included the Minnesota Child Development Inventory (MCDI), a parent report assessment of the infant's development, videotapes of mother-infant interaction and of infant motor development. Parents were paid a $30 incentive for the testing and videotaping.

The videotape of motor functioning followed a specific script. The child performed the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child were asked to play together for 15 minutes "as they would at home." Then for one minute the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent was asked to leave the room for 45 seconds, and taping continued for two minutes after the parent returns to the room.

The posttest battery was designed to provide information regarding the child's developmental change in the first 12 months (and yearly thereafter), and the effect of intervention services upon the child's development. Change in the family during this time, can also be examined.

Results and Discussion

The purpose of this study was to examine the effectiveness of an early, intensive motor intervention compared to a delayed comprehensive developmental intervention for a group of infants at risk for developmental delays because of a history of intraventricular hemorrhage or very low birthweight.

Comparability of Groups on Pretest Measures

Table 8.5 represents the comparability of groups on the pretest child and family functioning measures. The left side represents the comparison of all infants enrolled before July 1, 1989. The right side of the table represents the infants who are included in the analyses of data from the first posttest. There were no significant differences on any of the pretest measures of infant or family functioning.

Effects of Early Versus Delayed Intervention on Measures of Child and Family Functioning

The effects of the early intervention program on child functioning as measured by the Battelle Developmental Inventory were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b)

Table 8.5

South Carolina Age-at-Start Study
Comparability of Groups on Pretest Measures

	Active Subjects Enrolled By July 1, 1989 (n-68)								Subjects Included in First Posttest Analyses (n-56)								
	Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention					
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ANOVA F	ES[$]	P Value
•Age in months at Pretest	3.5	(.92)	32	3.4	(.96)	36	.46	.11	5.6	(.97)	27	3.4	(1.0)	29	0.64		.43
•Battelle Developmental Inventory (BDI)[+] DQs for:																	
Personal Social	91	(53)	32	94	(49)	36	.79	.06	84	(51)	27	89	(50)	29	0.11	-.10	.73
Adaptive Behavior	69	(57)	32	75	(60)	36	.67	.10	64	(58)	27	64	(58)	29	0.00	-.00	.95
Motor	81	(27)	32	84	(26)	36	.64	.11	77	(26)	27	81	(27)	29	0.28	.15	.60
Communication	70	(47)	32	70	(48)	36	.96	.00	63	(46)	27	58	(42)	29	0.18	-.11	.67
Cognitive	65	(53)	32	61	(42)	36	.74	-.08	62	(51)	27	52	(39)	29	0.63	-.20	.43
TOTAL	81	(47)	32	74	(39)	36	.50	-.15	76	(45)	27	66	(37)	29	0.80	-.22	.38
•Parenting Stress Index (PSI)[**]																	
Child Related	108	(20)	19	116	(15)	27	.14	-.40	109	(23)	15	115	(13)	20	.98	-.46	.32
Other Related	116	(26)	19	127	(27)	27	.16	-.42	116	(27)	15	122	(22)	20	.44	-.27	.51
TOTAL	224	(41)	19	243	(38)	27	.34	-.46	225	(45)	15	237	(33)	20	.78	-.41	.38
•Family Adaptation and Cohesion Evaluation Scales (FACES)[**]																	
Cohesion	4.5	(2.8)	20	5.8	(4.2)	27	.24	-.53	4.0	(2.2)	15	5.8	(4.4)	20	2.18	-.41	.15
Adaptability	6.5	(3.8)	20	6.2	(3.7)	27	.80	.07	6.8	(3.8)	15	6.1	(4.1)	20	0.23	.17	.63
Discrepancy	9.1	(11.0)	20	11.6	(12.5)	27	.49	-.22	7.1	(10.9)	15	12.7	(13.6)	20	1.70	-.41	.20
TOTAL	8.4	(3.6)	20	8.9	(4.6)	27	.70	-.14	8.1	(3.8)	15	8.9	(5.0)	20	0.28	-.16	.61
•Family Resource Scale (FRS)	118.6	(17.1)	18	115.3	(27.8)	27	.62	-.19	117.8	(15.8)	18	127.4	(29.3)	23	0.12	.33	.73
•Family Support Scale (FSS)	30.3	(13.5)	20	27.2	(12.4)	27	.42	-.22	29.9	(15.6)	18	32.6	(16.8)	23	1.54	.16	.22
•Family Index of Events (FILE)[**]	11.8	(5.6)	15	10.3	(7.1)	20	.50	.27	9.7	(7.3)	15	7.8	(5.3)	20	.45	.36	.50

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

[$] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divide by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

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to statistically adjust for any pretreatment differences between the groups. For either purpose, the degree to which ANCOVA is useful depends on the correlation between the covariates selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. Accordingly, these data were analyzed in a three-stage process. First, pretest BDI scores, demographics, and medical demographics were examined for potential differences. As reported above, the only pretest difference between the groups was in the proportion of males in the groups.

The second stage of the analyses was to examine the relations between posttest Battelle scores and the pretest measures via multiple regression analyses, again looking for potential covariates. These analyses indicated that the only pretest variable which accounted for more than 15% of the variance in the posttest Battelle scores was the pretest total Battelle score. Thus, differences between the Early and Delayed Intervention Groups were analyzed using one-way univariate analyses of covariance, with BDI pretest total score as a covariate. Table 8.6 represents the data for the one year posttest BDI scores for the early and delayed intervention groups. There were no significant differences between the groups on the BDI at one year of age.

As discussed above, a subsample of the overall group received the complete pretest battery. Thirty-two subjects who have had their one-year posttest also received the all of the family measures (PSI, FSS, FRS, FACES III, and the FILE) at

Table 8.6

First Posttest Measures of Child and Family Functioning for Alternative Intervention Groups for South Carolina Age-at-Start Study

Variable	Covariates$^{\Delta}$	Delayed Intervention				Early Intervention				ANOVA F	P Value	ES$
		$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n			
•Age in months at Pretest		13.9	(1.9)		27	13.6	(1.6)		29	.62	.18	
•Battelle Developmental Inventory (BDI)*												
DQs for:												
Personal Social	1	80	(27)	80	27	72	(25)	72	29	1.65	.20	-.29
Adaptive Behavior	1	93	(31)	92	27	90	(30)	92	29	.00	.97	0.0
Motor	1	78	(30)	77	27	70	(26)	71	29	.65	.42	-.20
Communication	1	86	(31)	86	27	78	(33)	79	29	.66	.42	-.22
Cognitive	1	84	(34)	83	27	85	(35)	86	29	.11	.74	.08
TOTAL	1	88	(30)	88	27	82	(27)	82	29	.65	.42	-.20
•Parenting Stress Index (PSI)												
Child Related		112	(25)		21	111	(19)		24	.02	.88	.03
Other Related		123	(30)		21	119	(28)		24	.26	.61	.14
TOTAL		235	(51)		21	230	(43)		24	.15	.70	.12
•Family Adaptation and Cohesion Evaluation Scales (FACES)+												
Cohesion		5.8	(6.9)		17	6.2	(5.2)		22	.06	.82	-.08
Adaptability		6.1	(3.1)		17	6.9	(5.4)		22	.26	.61	-.15
Discrepancy		12.6	(15.6)		17	12.1	(12.5)		22	.02	.90	.04
TOTAL		9.5	(5.6)		17	10.1	(5.4)		22	.34	.56	-.11
•Family Resource Scale (FRS)♣		117.8	(15.9)		18	125.4	(21.2)		22	1.59	.21	.36
•Family Support Scale (FSS)♣		29.9	(15.6)		18	33.4	(16.8)		22	.44	.51	.21
•Family Index of Events (FILE)♣		9.7	(7.3)		15	7.1	(4.6)		19	1.64	.21	.56

*Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

♣ Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

$ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divide by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

Δ Covariates: 1 = Total pretest Battelle Developmental Inventory scale score.

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the pretest. Use of pretest measures as covariates would thus have reduced the number of subjects who had posttest data available for analyses. Thus, the family measures were analyzed without covariates. These results are also represented in Table 8.6. Again, there were no significant differences between the Early and Delayed intervention groups.

The results of the analyses of the child and family measures indicated that after one year of intensive motor oriented intervention the differences between the groups were not statistically significant. Examination of the effect sizes for the child and family measures largely supports the results of the parametric analyses. Of 16 posttest effect sizes, 3 indicated that there was greater than .25 SD between the groups. The Personal Social dimension of the BDI showed a .29 SD difference in favor of the delayed intervention group, while the FRS and the FILE showed effect sizes in favor of the early intervention group (.36 and .56, respectively). While these effect size results are interesting, and suggest that the addition of the last group of subjects to be posttested next year may increase the power of the analyses, they do not form a strong pattern.

The same analysis procedure was followed for the second posttest which was given at 1 year of age. As of Sept. 1, 1989, 27 children has received this posttest. The results of the analyses of the child and family measures are presented in Table 8.7. These analyses indicated that the groups did not differ significantly at the second posttest.

The lack of between-group differences in the preceding results suggests a lack of effects for the early intervention. One aspect which has not been explored, however, is whether any of the participation variables were related to the children's outcomes. Correlational analyses were used to examine the relation of parent participation measures to first posttest BDI scores within the Early Intervention group. The percentage of scheduled visits that the parents attended was not

Table 8.7

Second Posttest Measures of Child and Family Functioning for Alternative Intervention Groups for South Carolina Age-at-Start Study

Variable	Covariates$^{\Delta}$	Delayed Intervention $\overline{X}$	Delayed Intervention (SD)	Delayed Intervention Adj.$\overline{X}$	Delayed Intervention n	Early Intervention $\overline{X}$	Early Intervention (SD)	Early Intervention Adj.$\overline{X}$	Early Intervention n	ANOVA F	P Value	ES$
•Age in months at Pretest		26.6	(1.8)		14	26.2	(1.67		13	.26	.61	.72
•Battelle Developmental Inventory (BDI)+												
DQs for:												
Personal Social	1	74	(23)	72	14	64	(23)	66	13	.50	.49	-.26
Adaptive Behavior	1	90	(27)	87	14	78	(22)	81	13	.50	.49	-.27
Motor	1	81	(24)	80	14	68	(26)	70	13	.98	.33	-.41
Communication	1	70	(24)	68	14	63	(23)	65	13	.10	.75	-.12
Cognitive	1	72	(26)	70	14	61	(22)	64	13	.46	.50	.23
TOTAL	1	76	(23)	74	14	68	(19)	70	13	.19	.67	-.17
•Parenting Stress Index (PSI)**												
Child Related		110	(20)		14	107	(21)		13	.15	.70	.15
Other Related		124	(20)		14	123	(22)		13	.01	.92	.05
TOTAL		235	(32)		14	230	(40)		13	.09	.77	.16
•Family Adaptation and Cohesion Evaluation Scales (FACES) **												
Cohesion		7.9	(7.7)		14	8.1	(5.7)		13	.01	.92	-.02
Adaptability		6.4	(3.6)		14	5.9	(3.9)		13	.07	.80	-.08
Discrepancy		12.4	(9.1)		14	11.2	(10.4)		13	.09	.77	.13
TOTAL		10.6	(7.4)		14	11.2	(4.3)		13	.04	.84	.08
•Family Resource Scale (FRS)		110	(18)		14	107	(21)		13	.18	.67	-.16
•Family Support Scale (FSS)		30	(13)		14	30	(10)		13	.00	.95	.00

+Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

♣Analyses for the FSS and FRS are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

$ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divide by the unadjusted standard deviation of the Delayed Intervention Group (see Glass [1976], Tallmadge [1977], and Cohen [1977] for a more general discussion of the concept of Effect Size).

$^{\Delta}$Covariates: 1 = Total pretest Battelle Developmental Inventory scale score.

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significantly related to any of the outcome variables. The interventionists' ratings of attendance, knowledge, and support of the intervention program were summed to provide one variable (with a range from 3 to 9) that could be used to express the interventionists' perception of the parents' participation. This variable, along with the percentage of scheduled visits the parents attended, was examined in relation to the one year posttest child BDI scores. Pearson's Product Moment correlation analyses based on data from the 29 subjects in the Early Intervention group indicated that the interventionists' rating of the parents' participation was significantly correlated with the children's receptive ($r = .36$, $p = .05$), expressive ($r = .54$, $p = .002$), and total communication ($r = .44$, $p = .02$) scores, and marginally related to the children's personal-social ($r = .35$, $p = .06$) and total BDI scores ($r = .28$, $p = .13$). While this result suggests that the children of those parents who are perceived by the therapists as "better" participators do better at one year, alternative explanations are possible. For example, the therapists might rate those parents whose children are developing most optimally as high in participation. This would be supported by positive correlations between therapist ratings and pretest BDI scores. Examination of the correlations between parent participation ratings and *pretest* BDI scores indicated significant relations with the personal-social ($r = -.42$, $p < .02$) and Total BDI scores ($r = -.41$, $p < .03$). These *negative* correlations suggest that the parents whose children performed most poorly at pretest were rated most highly on participation.

These results taken together, high participation ratings associated with low performance on pretest and high performance on posttest, suggest that those parents who receive the highest ratings have children who make the most progress. This result may support the importance of parent participation in the early intervention program. However, it is not straightforward, since the parents' actual attendance of scheduled visits was not related to any outcome measures.

Conclusions

It is clear from the analyses of the demographic data of the overall group that random assignment is working well to assure a balance of characteristics in the groups. The groups are balanced on all demographic and medical characteristics except the proportion of males in the groups. There was evidence, however, that this imbalance did not affect the outcomes. In addition, the groups did not differ on any of the pretest child or family measures. The results of the analysis of pretest child and family measures also indicate that random assignment has worked to balance the groups. There were no significant differences between the early and delayed intervention groups at pretest.

The results of the first year posttest indicate that, after one year of intensive motor oriented intervention, there is no indication that the early intervention group has demonstrated superior progress. The early intervention group did not show better performance on either child or family measures. Because the intervention was specifically targeted to motor development, it is necessary to emphasize that there were no differences on the Battelle Motor Dimension. The results of the analyses of the second posttest also indicated no superior effects for the early intervention group.

An interesting result is the relation between the interven-tionists' ratings of parent participation and BDI scores. This result appears to support the importance of parent participation in early intervention. The actual rating of parent attendance was not related to BDI scores, however. This makes the interpretation of this result less clear. This result will be examined in more detail as more subjects are added in the future.

The results of this study concur with those of two recently released studies (Goodman et al., 1985; Palmer et al., 1988). While there are important methodological differences between this study and those performed previously, the pattern of results begins to suggest that early intervention which is directed mainly or exclusively toward facilitation of motor development is not effective. It remains to be seen whether interventions that are more broadly based would be effective in preventing or remediating developmental problems.

The results and conclusions presented here must be regarded as tentative. There are still eleven subjects (19% of the total group) who are participating in the first phase of the intervention program, and who have not yet received their first posttest. Addition of these subjects to the data pool might affect the outcome of this study in future analyses.

COLUMBUS MEDICALLY FRAGILE PROJECT

Project #9

COMPARISON: Infants with Bronchopulmonary Dysplasia (BPD) or neurologic damage --Coordinated comprehensive services beginning one month prior to hospital discharge vs. services begun at 3 years of age.

LOCAL CONTACT PERSONS: Yvonne Gillette and Nancy Hansen, Columbus Children's Hospital

EIRI COORDINATOR: Nancy Immel

LOCATION: Columbus, Ohio

DATE OF REPORT: 10-9-89

Rationale for the Study

Although significant advances in perinatal and neonatal care over the last decade have improved the outlook for the extremely premature infant, this group of infants still accounts for 50% of the neonatal mortality rate, and the surviving very low birthweight infants contribute significantly to the population of children with multiple disabilities (McCormick, 1985; Raju, 1986). Two conditions frequently associated with survivors of premature birth are Bronchopulmonary Dysplasia (BPD) and intraventricular hemorrhage.

The presence of chronic pulmonary disease (bronchopulmonary dysplasia) at the time of discharge from the nursery is one of the strongest predictors for multiple handicaps (Escobedo & Gonzales, 1986; Koops, Abman, & Accurso, 1984; O'Brodovich & Millins, 1985). BPD is a unique disorder of the newborn infant who requires mechanical ventilation and oxygen therapy at birth (O'Brodovich & Millins, 1985).

BPD has become increasingly frequent as smaller and smaller infants survive, and affects up to 40% of surviving infants weighing less than 1500 g at birth (Escobedo & Gonzalez, 1986). Although BPD is a severe disabling disorder, it differs from other forms of chronic lung disease in that many affected infants demonstrate substantial improvement and recovery of lung function over the first few years of life. However, despite the encouraging improvement in pulmonary status, up to 40% of these infants have other major handicaps (Koops et al., 1984). The most frequent handicaps include growth failure, developmental delays, neurologic insults, visual problems, and deafness (Koops et al., 1984). The infant with BPD continues to manifest developmental delays well into the third and fourth years of life (Mayes et al., 1983; Meisels et al., 1986).

The etiology of the developmental delays observed in these infants is usually multifactorial and may be related to inadequate nutrition during a critical period of brain growth and differentiation. In addition to demonstrating developmental delays, these infants have substantial health problems beyond the neonatal period, and up to 30% are re-hospitalized during infancy (Hack et al., 1983; McCormick et al., 1980).

A second predictor for neurodevelopmental delay in premature low birthweight children is the presence of Grade III or IV intraventricular hemorrhage (IVH). Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of children who had experienced severe IVH demonstrated moderate to severe handicapping conditions by age three.

Recent advances have been made in the early identification of brain insults which predict later neurologic impairment in this group of infants. It is now routine to monitor preterm infants for intracranial bleeding with the non-invasive cranial ultrasound, and it is possible to identify infants in the first few months of life who are at extremely high risk for later neurodevelopmental delays on the basis of structural brain damage.

Perinatal care and medical advances have dramatically improved the short-term outlook for the critically ill newborn. However, most of the gain in expertise and knowledge is based in the tertiary care hospital and is not available to the infant, family, or local health, social service, and early intervention personnel following hospital discharge. Consequently, many local primary care physicians and public health nurses are uncomfortable supervising and directing the care of these complex children, and families that live two to three hours from the tertiary care hospital have difficulty accessing adequate local medical care. The resulting fragmentation of health care with multiple visits to multiple specialists at often geographically distant tertiary care centers is cited by parents as a major problem in caring for their chronically ill children.

Added to the problem of inadequate local health care resources, families may find that local early intervention personnel are not trained in the specialized medical, educational, and social needs of medically fragile infants and their families, and that home-based intervention delivery may not be available as a service option.

Evidence suggests that regionalization of care to the home and community is an effective means of improving the functional status of the medically fragile infant. Several studies have successfully used home-based intervention programs to either facilitate early discharge from the hospital or to facilitate developmental progress in low birthweight infants. Recent reviews of the literature concerning preventive intervention studies indicate that such programs generally have an immediate positive effect, despite the fact that most programs have not been comprehensive in terms of family functioning, quality of life for the child and family, or social competence of the child (Bennett, 1987).

Philosophical and Theoretical Rationale for the Services

The practices of the Columbus Medically Fragile Project (Columbus/MF) flow from the theoretical position set forth by Urie Bronfennbrenner in The Ecology of Human Development (1979). Bronfennbrenner views the environment as a set of nested structures, each inside the next. The basic unit is the setting, such as the family, which includes the developing person. The relationships between settings form the next level of influence upon development. Bronfennbrenner argues that the relationships between settings can play as decisive a role in development as the events within a given setting. Consequently, this project endeavors to facilitate the family's ability to meet the infant's needs and the relationship between the hospital and the community, since both can greatly influence the infant's development. Bronfennbrenner also contends that the practices of society at large can profoundly influence the developing person. The importance of this level of influence is exemplified by P.L. 99-457, the public law authorizing service to handicapped infants and toddlers, which has and will affect services available to handicapped infants and toddlers.

As the Bronfennbrenner model predicts, the families of medically fragile infants vary along several major dimensions: the functioning of the family, which includes and is affected by the status of the infant; the influence of the hospital; the effects of the practices of society at large; and the community resources available to the family. Following this model, the project attempts to enhance the family's functioning, the status of the infant, the community's ability to meet the family's and infant's needs. The project also attempts to influence societal attitudes and practices as regards the care and development of the medically fragile infant and his/her family. Figure 1 illustrates the Columbus Medically Fragile Model.

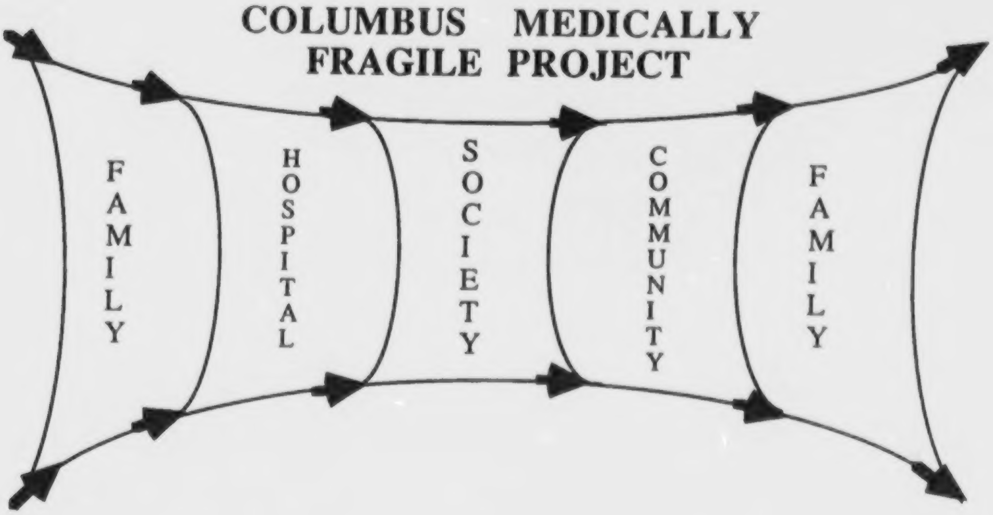

Figure 1: **Path of the Columbus/MF Project Model facilitating optimal family and infant functioning from the hospital to the community and home.**

The Columbus/MF program serves as a model for specialized care and support to the home and community following hospital discharge of the infant, rather than basing this support in the tertiary care hospital. As previously indicated, the medically fragile infant is at established risk for developmental delays due to serious long-term medical and nutrition problems, lack of coordinated follow-up and intervention services in the local area, and lack of specialized training for local health, social service, and educational intervention personnel. Therefore, there is a documented need for a collaborative intervention/training model to implement the transition and regionalization of service from the tertiary care hospital to the local intervention systems.

Overview of Study

This study compares the effects of a coordinated and comprehensive system of early intervention services initiated prior to three years of age with the effects of comprehensive services initiated at age three. One group of infants, the early intervention group, receives coordinated services to facilitate the transition of their care from a centralized source, the Columbus Children's Hospital, to a regionalized source, agencies within their local communities. The delayed intervention group receives only the centralized services currently available to CCH NICU graduates. The current level of services for children in this group have been described by Koops, Abman, and Accurso (1984). These services include medical follow-up and management, developmental evaluation, and referral through the hospital follow-up clinic. At age three, children in both groups will begin receiving comparable preschool services.

Methods

The Columbus/MF Project is a cooperative research effort with "A Collaborative Approach to the Transition from the Hospital to the Community and Home Project," an HCEEP Demonstration Project of the Columbus Children's Hospital (CCH) in Columbus, Ohio. When full enrollment is reached, the project will serve 40 graduates of CCH's newborn intensive care unit (NICU) and their families who live in Ohio's Perinatal Region IV. This region encompasses 33 counties in the mid- and southeastern sections of the state. The area is primarily rural, although it includes the urban center of Columbus.

The Columbus/MF project is currently completing the second year of a three-year funding period. Year 1 was devoted to model development and focused on three objectives. The first objective was to establish collaborative intervention teams to service medically fragile infants and their families in Perinatal Region IV. To meet this objective, local administrators of health, social service, and education/early intervention agencies entered into collaborative agreements with the HCEEP project, and local intervention personnel were identified to provide services.

The second objective was to construct an intervention and service delivery model utilizing the following multiple assessment factors: current status of infants and their caregivers, stresses on the family and extra-familial systems, and the availability and use of family and extra-familial supports. Assessment and intervention protocols were developed and compiled to assess health and nutritional status, developmental status, parent-child interaction, home environmental factors, and family stresses and needed supports. The measures assessing infant and family characteristics are described in further detail in the data collection section of this paper.

The final objective which was met during the project's first year was the training of local collaborative intervention teams in the family-focused, home-based intervention model. In addition to orienting the collaborative intervention teams to the model, a series of multidisciplinary workshops, focusing on the medical, educational, and psychosocial needs of these infants and their families were held for all team members to promote collaborative case management, and continuity and transition of services.

During the past year, the project's second funding year, the efforts have concentrated on subject enrollment, coordination of services and service provision, and data collection.

Subjects

The Columbus/MF project began enrolling subjects on October 1, 1988, and there are currently 34 subjects enrolled. Enrollment will be continued until 40 medically fragile infants and their families have been enrolled and are actively participating in the study. It is expected that full enrollment will occur by September 30, 1989.

Recruitment. Medically fragile infants who are hospitalized in the Columbus Children's Hospital Intensive Care Unit are eligible to participate in the study if they have been diagnosed with moderate to severe BPD and have a need for oxygen therapy and/or two or more pulmonary medications upon hospital discharge. Infants with neurologic conditions (severe [Grade IV] perinatal intraventricular hemorrhage, hydrocephalus, microcephaly) requiring specialized equipment; i.e., feeding pumps, suction, and/or aerosol equipment are also eligible.

Eligible infants are identified for inclusion in the study when their weight reaches 1500 g (approximately one month before discharge). At that time, the parents are contacted by the project's clinical nurse specialist. The nurse explains to the parents the nature of the study, requests their participation, and if parents are willing, obtains informed consent. If parents decide not to participate in the study, their infant receives routine medical and developmental follow-up through the Neonatal Follow-up Clinic, and, if necessary, is referred to local agencies for health, occupational therapy, physical therapy, and early intervention services until the age of three. At age 3, preschool services for children with handicaps will be available through the local school district. Parents are informed of their child's group assignment after they have completed the informed consent procedure.

Assignment to groups. Infants will be enrolled in the study continuously between October 1, 1988, and approximately September 30, 1989. Following enrollment, the infants are randomly assigned to either the early or late intervention groups after being stratified by their primary diagnosis of BPD or neurologic damage. The BPD and neurologic groups are each further stratified into groups of more or less severe illness based on the medical severity index developed by the project co-director, Nancy Hansen, M.D. The severity index allows the medical doctor to rate the infants on a scale of 0-5, with 5 being the most severe or abnormal rating on nine variables thought to be related to predicted medical outcome. The variables include the infant's degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A total severity score ranging from 3 to 45 points is obtained. Infants receiving a score of 18 and below are determined to be "low risk," and those receiving a score of 19 and above are considered "high risk." Following both stratification processes, group assignments are randomly made by the EIRI site coordinator who is unknown to the infants and their families.

Subject Attrition. There have been 35 subjects enrolled in the study to date. One subject, who was in the early intervention group, died following pretesting. The remaining 34 subjects currently receive the services as described in the Intervention Programs section.

To minimize attrition, both the onsite coordinator and the EIRI coordinator maintain updated telephone numbers and addresses of the participants. Data is collected in person every six months until the infant reaches 24 months corrected age. Infants and families in the early intervention group are in frequent personal and telephone contact with study personnel as intervention services are delivered. By definition, infants in the delayed intervention group do not meet with study personnel between assessments; however, the study has been successful in assessing infants in both groups on time. Study personnel have arranged for transportation services to assist families in meeting scheduled assessment appointments if necessary.

Demographic characteristics. Information has been gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Results of the parent surveys indicate that 48% of the infants are from families living in Columbus, Ohio, and its immediately surrounding area. The remaining 52% reside in towns and rural areas of central and southeastern, Ohio. The total sample is composed of 79% Caucasian infants and 21% non-Caucasian infants. Seventy-seven percent of the infants are from two-parent families, and 96% are from homes where

English is the primary language spoken. Further information about the demographic characteristics of the infants and families in each group will be presented in the Results and Discussion section.

Intervention Programs

The Columbus/MF Project compares an early intervention to a later intervention program. Children in both groups receive medical follow-up after their initial discharge from the NICU, and, if needed, are referred for preschool services through the public school system or MR/DD programs (mental retardation/developmental disabilities) when they reach age three. The early intervention group also receives coordinated and comprehensive local services designed to improve their health and developmental outcome, and to ease their transition from the tertiary hospital to the local community. The delayed intervention group is referred to all indicated services identified at follow-up clinic visits.

Early intervention program. Intervention services provided to the early intervention group consist of pre-discharge hospital visits, medical follow-up clinic services, coordinated multidisciplinary home-based early intervention services, and preschool services as needed. The intervention begins with two to three weekly hospital-based visits with families approximately one month prior to the infant's discharge from the NICU. The hospital-based visits, which are initiated by the project's clinical nurse specialist and/or social worker, provide an opportunity for families to begin to establish a support system with ties to both CCH and to their home communities, and to allow the project to assist families in planning for their infant's home care needs prior to discharge. They also allow the families, with the assistance of the project team, to begin to identify and initiate contacts with service providers in their local areas.

After hospital discharge, infants receive regular medical supervision and developmental evaluation through Columbus Children's Hospital High-Risk Neonatal

Follow-up Clinic. The first follow-up visit occurs two weeks post-discharge. Additional visits are scheduled for 6, 12, 18, and 24 months of age (age corrected for prematurity), and yearly thereafter. The clinic is staffed by a neonatologist, a social worker, a nurse coordinator, and an occupational therapist who provide health monitoring and developmental evaluation. Full ancillary services (radiology, drug level monitoring, pharmacy, respiratory therapy, ophthalmology, and audiology) are available in the hospital complex.

Regular home visits are initiated following hospital discharge and continue until the child reaches 24 months (age corrected for prematurity). The Columbus/MF project's clinical nurse specialist and developmental consultant attend the home visits with local service providers on at least a monthly basis. Participation in these collaborative home visits can be interdisciplinary or within a discipline, depending upon the concerns surrounding the infant and the family needs. Participants in these collaborative home visits include at lease one member of the Columbus/MF project staff, one local service provider, the family (or at least the primary caregiver), and the infant. When conducting a collaborative home visit, the resource team members follow a four-step approach: (1) update, (2) plan, (3) practice, and (4) integrate into the family routine.

Update refers to the process during which the intervention group (resource team member, local service provider, and the family) reviews any recent developmental assessments and previous plans. From the information shared in the update discussion, the intervention group plans for subsequent parent education and specific intervention for the infant and family related to developmental, health, and nutrition issues. Members of the team practice specific intervention activities which are then integrated into family routines. Plans are put in writing and a method for monitoring the program is selected.

Local service providers are also encouraged to assist families in locating and utilizing additional community services such as consulting or respite care. The project gradually shifts responsibility from the resource team to the communities. The timing of this shift is individualized to meet the family's needs and the ability of the local service providers to take a more direct and independent role working with this special population. The ultimate goal of the project is to transfer full responsibility for the care of the medically fragile infant to local service providers (physicians, public health nurses, early educators, etc.). It is anticipated that these agencies will continue to provide necessary services after the children reach 24 months of age and are no longer involved in this project.

At three years of age, early intervention services will be available through the local school districts or in county mental retardation and developmental disabilities programs. It is anticipated that developmentally appropriate preschool services will be provided in the least restrictive environment according to an approved IEP (individualized education plan).

Delayed intervention group. Infants in the delayed intervention group will receive the services that are currently available to graduates of the NICU. These services include the same medical and developmental follow-up services of the High-Risk Neonatal Follow-up Clinic that infants in the early intervention group receive. However, subjects in the delayed intervention group do not receive the coordinated community early intervention services that are available to the early intervention group. Infants in the delayed intervention group who are found to be delayed, at-risk for delay, or in need of community services by the follow-up clinic, are referred to community agencies by the hospital follow-up clinic. These agencies are notified of the referral. Based on past experience, referral agencies have been utilized inconsistently at best. Records documenting how often infants in the delayed group have accessed referral services are kept and will be used in the data analysis. At age three, children in the delayed intervention group will also be eligible for preschool services for handicapped children if they meet entrance criteria at that time.

Treatment verification. Treatment verification procedures are carried out to ensure that treatment occurs in accordance with the proposed intervention program plan. It consists of data collected on the child, family, and intervention program. Treatment verification data on children in the early intervention group includes the Individualized Family Service Plan (IFSP), a log of individual services provided, and attendance records. This data is collected and recorded by the local service provider and transition support staff. Information about additional services received by the child is collected from parents of children in both groups at pretest and at all interim and posttests.

Data on the family includes an estimate of the quality of parent involvement by CCH project staff, a parent satisfaction questionnaire completed by parents at posttest, a record of parent time spent working on child's programs collected by the local service provider, an estimate of how well the parents feel they have been able to integrate the infant's programs into their daily routine, and parent telephone interviews conducted by EIRI staff. Treatment verification information is also gathered on the intervention program itself. The project staff evaluates the quality of the local service staff. EIRI staff maintain weekly telephone contact with the project staff, conduct two yearly site visits, and conduct an annual onsite evaluation (Site Review).

Site Review

A site review of the Columbus/MF project was conducted on July 11-12, 1989. The purpose of this review was to collect information about the nature and quality of the intervention services being provided to the early and delayed intervention groups, to verify that the research conducted by EIRI is being implemented as intended, and to collect needs assessment data which will be used for future program planning by site administrators. The Guide for Site Reviews of EIRI Research Sites was used to evaluate program components of the project, and included a general review of program philosophy, subject records and assessment procedures, observations of staff-child and staff-parent interactions, and a review of administration and management procedures.

The overall results of the Site Review were very positive. Comprehensive and coordinated services are being provided to the early intervention group and data is being managed in an exemplary manner. A full report of the site review is available from the site coordinator.

Cost of intervention. the cost of early versus later intervention will be determined by analyzing costs for both program alternatives on two levels. The first level consists of the hospital-based team which coordinates services for the children on the local level. The second consists of the costs associated with the local teams' providing direct services to the children in the research study. Resources on both levels include direct service and administrative personnel, occupancy, equipment, materials and supplies, and travel. At this point, Year One costs have been collected and analyzed. Since Year one is the start-up year and no children were served, costs include resources used in Year One for inservice, planning, publicity, and program development (including curriculum development).

Total cost for resources used in Year One are presented in Table 9.1. Salary and benefits were calculated according to the percentage of FTE worked on the project for program administrative personnel (project director, project coordinator, several consultants, and secretaries). Hospital administrative costs were based on the hospital's indirect rate for administration (.207). Occupancy charges are based on the 1988 rate per square foot for space used by the project, including plant operation, housekeeping, maintenance, repairs, and insurance. The project used 269.2

Table 9.1

Columbus/MF Project Year One Costs (1988-1989)

Resources	Cost
Agency Resources	
Direct Services	$ 14,282
Administration	
Program	$ 61,894
Hospital	15,768
Occupancy	7,519
Equipment	4,653
Transportation	3,791
Materials/Supplies	4,478
SubTOTAL	***$112,385***

square feet at $6.60 per square foot for space, $2.65 per square foot for plant operation, $6.69 per square foot for housekeeping, $8.73 per square foot for maintenance and repairs, and $3.53 per square foot for insurance for a total of $27.93 per square foot. Equipment includes office equipment and furniture used for 3.0 FTEs. Market replacement values were ascertained for each item and an annualization factor was applied to arrive at an annual cost accounting for interest and depreciation. Travel expenditures were based on actual mileage and costs associated with conference attendance in relation to the project. Finally, the cost of materials and supplies was based on the project's annual expenditure on these items. Cost analyses are ongoing for Year Two to determine the cost per child in both groups for services received.

Data Collection

Data collected at the Columbus project include both the results of outcome measures being used across all EIRI sites and measures that are specific to this study. These measures include assessments of both child and family functioning. As indicated earlier, infants are enrolled in the study approximately one month prior to their discharge from the NICU, and they are pretested two weeks following discharge. Pretest data have been collected on the 24 infants who are at least two weeks post discharge. Pretest data have not been collected on the infants who are enrolled in the project, but who currently remain hospitalized or who are not yet two weeks post discharge. Posttest data is collected at 12 and 24 months corrected age. Interim test data is collected 6 and 18 months corrected age. All EIRI assessments take place at CCH in conjunction with NICU follow-up clinic visits.

Recruitment, training, and monitoring of diagnosticians. In June 1988, diagnosticians were trained in Columbus by the EIRI Evaluation Specialist to administer the Battelle Developmental Inventory (BDI). Three diagnosticians were Registered Occupational Therapists currently employed in the Occupational Therapy Department of Columbus Children's Hospital. The fourth diagnostician was an Early Childhood Specialist currently employed in the Child Life Department of Columbus Children's Hospital. While their work assignments involve in-patient and out-patient care, none of the therapists is assigned to the NICU or the Neonatal Follow-up Clinic. They evaluate the subjects as a part of their regular employment; however, they are, and will remain, uninformed as to the purpose of the study and to the group assignment of the infants.

Prior to the formal BDI training, the diagnosticians were required to become familiar with the BDI through a review of the test manuals, practice in scoring, viewing of a videotape of test administration procedures, and completing a self-mastery test. The diagnosticians then completed three practice BDI administrations.

The third practice session was videotaped and reviewed by the EIRI Evaluation Specialist who then certified the diagnostician. In each year following certification, 10% of each diagnostician's test administrations are shadow scored for reliability by the onsite assessment coordinator. The assessment coordinator is also responsible for tracking and scheduling evaluations for each subject. The hospital social worker assigned to the Neonatal Follow-up Clinic has been trained to administer the demographic survey and the measures of family functioning. A more in depth discussion of test administration procedures is available in the EIRI 1986-87 annual report.

Pretesting. Two weeks following discharge from the NICU, all infants in the study are scheduled for the first visit to the Neonatal Follow-up Clinic, where their health status, growth, pulmonary function, and rehospitalization record are evaluated. At that time, infant assessments also include the BDI and the Infant Neurological International Battery (the Infanib), a measure of neurologic integrity in the newborn and infant. The Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available to the family, the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months, and the Parent Survey (demographic information) are completed by the parents. Parents are paid $20 for completing the pretest assessment battery. Tests and questionnaires are returned to EIRI for scoring, data entry, and storage. Table 9.2 presents a schedule of assessment measures and the ages at which they are administered.

Table 9.2

Schedule of Assessment Measures--Columbus Age-At-Start

	Enrollment	Discharge	Pretest–2 wks Post Discharge	Interim Test I 6 mo CCA*	Posttest I 12 mo CCA*	Interim Test II 18 mo CCA*	Posttest II 24 mos CCA*
BDI			X		X		X
PSI			X		X		X
FACES III			X		X		X
FSS			X		X		X
FRS			X		X		X
FILE			X		X		X
Additional Services Survey			X	X	X	X	X
Medical Severity Index	X	X					
EIRI Parent Survey			X		X		X
Infanib			X	X	X		
Medical Visit Summary		X	X	X	X	X	X
Carey Infant				X			
Bayley				X		X	
Social Work Parent Survey				X			
Report of Child Health					X		X
Parent/Child Interaction Video					X		X
Carey Toddler							X

* Corrected Chronological Age (age corrected for prematurity)

Interim tests. Interim tests are scheduled when the infant is 6 and 18 months old (age corrected for prematurity). At the time of the 6-month interim test, the infant receives a physical examination and is assessed using the Bayley Scales of Infant Development and the Infanib. The parent completes the Carey Infant Temperament Scale, assessing their estimate of their infant's temperament. An additional services form reporting services that have been used since pretest in conjunction with infant care and development, and a social work questionnaire developed by the CATCH team social worker are completed in an interview with the social worker. The 18-month interim test consists of a physical examination, readministration of the Bayley, and the additional services survey. Parents are paid $20 for completing each interim testing batter.

Posttests. Posttests are scheduled when the infants are 12 and 24 months (ages corrected for prematurity). At the posttest sessions, infants and their parents again complete the pretest battery. In addition, parents complete the Parent Satisfaction Survey and the Report of Child Health. The additional services form will be completed during an interview with the social worker. At the 12 and 24 month posttests, parents and infants will be videotaped during a scripted 16-minute period which will include free play and structured activities. The videotapes will be coded and scored as a measure of parent-child interaction. Parents will be paid $20 for completing each posttest battery. Table 9.3 presents a summary of the number of infants who have been tested to date.

Table 9.3

Summary of Subjects Assessed by July 1, 1989

Time of Assessment	Number Assessed to Date
2 Weeks Post Discharge	24
6 Months (age corrected for prematurity)	7
12 Months (age corrected for prematurity)	0
18 Months (age corrected for prematurity)	0
24 months (age corrected for prematurity)	0

Results and Discussion

The purpose of the Columbus Medically Fragile study is to compare the effectiveness of comprehensive and coordinated early intervention services begun prior to the infant's discharge from the NICU to delayed intervention services started at age three. Currently, there are 24 infants who have been pretested two weeks after their discharge from the NICU.

Comparability of Groups on Pretest Measures

A pretest comparison of family demographic characteristics indicated that the early and delayed intervention were similar in all characteristics (Table 9.4). The early intervention group tended to have slightly fewer infants living with both parents than did the delayed intervention group; however, the difference was not statistically significant.

Table 9.4

Comparability of Groups on Demographic Characteristics for Columbus Age-At-Start Study

	Active Subjects Enrolled by July 1, 1989							
	Delayed Intervention			Early Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
• Age of child in months as of 7/1/88	7.6	2.7	13	7.8	4.6	11	.90	.06
• Age of mother in years	25.8	6.4	12	27.6	7.3	11	.55	.28
• Age of father in years	30.9	10	12	33.9	7.5	9	.45	.34
• Percent male*	69	—	13	82	—	11	.50	.42
• Years of education for mother	12.5	2.2	12	13.3	2.4	11	.43	.35
• Years of education for father	12.5	1.7	12	12.5	2.3	11	.96	.00
• Percent with both parents living at home	91	—	11	64	—	11	.14	-1.7
• Percent of children who are Caucasian*	85	—	13	73	—	11	.50	-.43
• Hours per week mother employed	12.0	16.1	12	13.5	17.4	11	.84	.32
• Hours per week father employed	34.7	17.9	11	34.5	18.2	11	.97	-.01
• Percent of mothers employed as technical managerial or above	17	—	12	36	—	11	.30	.59
• Percent of fathers employed as technical managerial or above	25	—	12	18	—	11	.71	-.25
• Total household income^	$29,833	$25,440	12	$32,545	$31,473	11	.89	.10
• Percent receiving public assistance	50	—	12	55	—	11	.84	.12
• Percent of children in daycare more than 5 hours per week*	17	—	12	9	—	11	.61	-.39
• Number of siblings	1.6	2.1	12	1.0	1.1	11	.42	-.37
• Percent with English as primary language	92	—	13	100	—	11	—	1.59

NOTES: * Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

A comparison of the demographic characteristics of all infants enrolled in the early and delayed intervention groups at pretest indicated that the groups are similar in most medical characteristics. However, as can be seen in Table 9.5, infants in the delayed intervention group had significantly more sensory (visual and/or hearing) impairment as measured by the Medical Severity Index administered at discharge. Infants in the delayed intervention group tended to receive slightly, but not significantly, lower scores on the Infanib.

Table 9.5

Comparability of Groups on Medical Characteristics for Columbus Age-At-Start Study

	Delayed Intervention			Early Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
• Gestational age (weeks)	31.6	4.7	13	30.9	4.8	10	.72	-.15
• Birthweight (grams)	1839.8	918.2	13	1496.1	769.6	10	.35	-.40
• Primary Diagnosis:								
Neurological Impairment	53.8%	—	7	40%	—	4	.52	-.35 .35
Bronchopulmonary Dysplasia	46.2%	—	6	60%	—	6		.35
• Severity Index at Enrollment (Range: 3-45)	14.6	3.6	13	14.4	4.8	10	.91	-.05
• Length of Hospitalization (Days)	86.7	63.2	13	111.4	85.1	10	.43	.34
• Total Doses of Medication Daily at Discharge	4.3	4.8	13	6.5	12.2	10	.60	.27
• Technology Dependence at Discharge*	.46	.9	13	1.4	2.1	10	.21	.66
• Feeding Status at Discharge*	1.6	1.3	13	1.4	1.3	10	.69	-.15
• Sensory Impairment at Discharge*	1.2	1.1	13	.4	.5	10	.05	-.95
• Infant International Neurological Battery (Infanib)^ (range 20-100)	60.7	4.3	12	56.8	6.8	11	.12	-.68

NOTES: * Technology dependence, feeding status, and sensory impairment at discharge were measured on a scale of 0 - 5 with low scores being more favorable.

^ Higher scores on the Infanib indicate greater neurological maturity.

Table 9.6 shows infant pretest scores on the BDI and measures of family functioning. The groups were similar on all of the BDI domain and total scores.

They were also similar on most measures of family functioning, including the PSI, FRS, FSS, and FILE. The groups differed significantly, however, on the FACES measure of family cohesion and total scores. The differences characterize the families in the early intervention group as being less balanced in terms of cohesion than the families in the delayed intervention group.

Conclusions

Overall, the pretest comparisons indicate that randomization procedures have resulted in well-matched groups as the intervention phase of this project began. Statistical differences between groups were found to exist in the degree to which infants demonstrated sensory impairment when they were discharged from the NICU and in their degree of family cohesiveness as described by the infants' parents. The groups were found to be similar on all other infant and family demographic characteristics and on measures of infant and family functioning. In light of the many different comparisons which were made (i.e., the many different variables on which groups were compared), it is not surprising to find several on which there are statistically significant differences between groups. However, when data are considered in total, it appears that groups are well matched and very comparable.

That the intervention has been initiated as intended is evidence by the fact that all of the infants in the early intervention group were referred to their county collaborative groups as they were discharged from the hospital, while only 15% of the infants in the delayed intervention group received such a referral. It remains to be seen how clearly the groups will remain distinct in their ability to access and utilize community services to meet the needs associated with having a medically fragile infant.

Table 9.6

Pretest Measures of Child and Family Functioning

Variable	Delayed Intervention $\bar{x}$	Delayed Intervention (SD)	Delayed Intervention n	Early Intervention $\bar{x}$	Early Intervention (SD)	Early Intervention n	p Value	ES
• Age in months at pretest	1.15	1.6	13	1.45	2.7	11	.741	.14
• Battelle Developmental Inventory (BDI)[+$]								
Personal Social	6.0	4.2	13	8.1	7.2	11	.41	.38
Adaptive Behavior	3.8	2.2	13	4.4	2.8	11	.56	.24
Motor	5.2	4.8	13	5.1	5.0	11	.95	-.02
Communication	4.2	2.1	13	5.2	2.4	11	.32	.45
Cognitive	3.7	3.2	13	3.6	4.0	11	.97	-.03
TOTAL	22.9	15.4	13	26.5	20.0	11	.62	.01
• Parenting Stress Index (PSI)[#@$]								
Child Related (range 50 to 250)	103	19	12	113	23	11	.27	-.48
Child Related (range 54 to 270)	116	24	12	120	22	11	.62	-.18
TOTAL (range 101 to 505)	218	41	12	233	39	11	.39	0
• Family Adaptation and Cohesion Evaluation Scales (FACES)[#*$]								
Adaptation (range 0 to 26)	2.8	2.0	12	6.1	6.7	11	.14	-.78
Cohesion (range 0 to 30)	5.3	4.1	12	8.9	5.2	11	.07	-.78
TOTAL (range 0 to 40)	6.3	3.9	12	12.2	6.2	11	.01	-1.18
Discrepancy (range 0 to 80)	13.5	11.6	12	6.5	10.4	11	.15	.63
• Family Resource Scale (FRS)[&%$]	121	17	12	122	21	11	.92	.05
• Family Support Scale (FSS)[&%$]	26.9	8.4	12	32.0	11.5	11	.24	.52
• Family Index of Life Events (FILE)[#^$]	10.7	4.5	12	12.5	7.4	11	.46	-.31

NOTES: [+] Statistical analysis for BDI were conducted using raw scores for each of the scales.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FACES III, and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[^] A low raw score and/or a high percentile score indicates lower stress level, and a positive ES is more desirable.

[$] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the x scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; Cohen, 1977; for a more general discussion of the concept of Effect Size).

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Future Plans

For the remainder of this project's funding period, efforts will be directed toward continued provision of services to infants and their families in the early intervention group and toward data collection from both groups.

WABASH AND OHIO VALLEY SPECIAL EDUCATION

Project #10

COMPARISON: Toddler-Aged Children with Mild to Moderate Handicaps--5-day-per-week center-based program versus a home-based program that provides weekly visits.

LOCAL CONTACT PERSON: Connie Luthe, Program Coordinator, Wabash and Ohio Valley Special Education District

EIRI COORDINATOR: Mark S. Innocenti

LOCATION: Norris City, Illinois (Southeastern Illinois)

DATE OF REPORT: 10-9-89

Rationale for the Study

A number of questions currently exist regarding the efficacy of early intervention for young children who are handicapped (Casto & Mastropieri, 1986). One of these questions concerns the intensity of the program in which the child participates. The common assumption for early intervention service is "more intense is better." However, there is some evidence that this conventional wisdom about early intervention effectiveness may not always be true (Casto, 1987).

The intensity issue is a critical issue that speaks to program effectiveness and may directly affect funding and services. The recent passage of P.L. 99-457, although opening up service opportunities for a large number of previously unserved children, has placed additional financial demands on those organizations that provide intervention services. One area where the issue of effective services and funding is most pronounced is in regard to providing services to infants and toddler aged children with handicaps. P.L. 99-457 has left these intervention services to state discretion, and funding issues are not well defined. In lieu of clear, experimental evidence regarding the intensity of programs, restrictive funding forces service provision agencies into apparently cost-effective, but not necessarily best practice, options. The purpose of this study was to investigate two common approaches, that vary greatly in intensity, for providing early intervention services to toddler-aged children with handicaps. The information from this empirical investigation, and others such as this, will provide a knowledge base for school administrators and others when developing early intervention programs.

Review of Related Research

The most common service delivery model for infant and toddler-aged children with handicaps is the home-based model (Bricker, 1986). This model typically provides services on a 1-hour-per-week basis (Bricker, 1986) and can take one of two forms (c.f., Bailey & Wolery, 1981; Beller, 1979; Karnes & Zehrback, 1977): (a) home-based services where an early interventionist visits the home, or (b) center-based consultation to parents where parents visit an early interventionist who is located at a center. Regardless of form, the services provided to both children and families are similar. These services usually consist of some form of developmental intervention for the child and the provision of parent support. Parents are usually provided training in intervention techniques and expected to provide training to the child either through direct intervention or incidental teaching between visits.

Research regarding the intensity of home-based models has focused primarily on varying the frequency of contacts with the early interventionist. Studies that have compared one home visit per week vs. 2 week (Lowitzer, 1988), 1 week vs. 3 week (Mott, 1988), and 1 week vs. one every 2 weeks (Burkett, 1982) have not found differences in child development or family functioning as a result of frequency of home visits. In a long-term study, Sandow, Clarke, Cox, and Stewart (1980) compared preschoolers with handicaps whose parents received home visits for a 3-year period at either 2-week or 8-week intervals. After 2 years, children in the less frequently visited group made greater progress, but this difference disappeared after 3 years. All of the above studies were relatively free of confounds from the use of differing interventions within the study, and all except one (Burkett, 1982) used young children with handicaps and their parents as subjects.

Evidence is beginning to build that more frequent visits in a home-based model does not impact on program effectiveness. There are at least two possible explanations for this finding. First, it may be that age at start is the real issue of interest and that lack of differences with different intensities is attributable to the fact that very young children are not yet capable of making differential progress. Second, it may be that the interventions compared in previous intensity studies were not sufficiently intense to find differential effects. Both of these possibilities could be explored through changing the focus of research to other intensity comparisons. The most apparent comparison would be with other appropriate models of service delivery. Although this type of comparative research has occurred with disadvantaged populations, there is a paucity of this type of research on young children with handicaps (see Bronfenbrenner, 1974; Casto & Mastropieri, 1986). For example, studies have not been conducted that directly compare the efficacy of center-based and home-based service options for toddler-aged children with handicaps. The center-based model is characterized by the child attending a classroom located at a school or some other facility. This model provides more hours of contact with an early interventionist and has been used to provide intervention services to toddler-aged children. Such research would provide additional information to the program intensity question as well as providing information on the relative effectiveness of these different models for toddler-aged children.

Overview of Study

The purpose of this study was to investigate program intensity with handicapped children under 36 months of age by comparing two early intervention programs of different intensity.. Children in one group received 5-day-per-week, 2-1/2 hours per day services in a classroom established to provide educational/developmental services for children with handicaps (center-based model). The children in the other group received 1-hour-per-week intervention services at home by a trained home intervenor (home-based model). Program efficacy was addressed by assessing child and family outcomes. The effect of intervention programs on families has been overlooked in the majority of early intervention studies (Casto & Mastropieri, 1986; Dunst, 1986), but is an important area that should be considered (Bronfenbrenner, 1979; Dunst, 1986). This study will assess effects on the family through a variety of measures.

Method

Program Organization and Background

This study was conducted in conjunction with the Wabash and Ohio Valley Special Education District (WOVSED). WOVSED provided special education services to nine counties in rural Illinois. State funding was granted to WOVSED to expand birth-to-3 intervention services while comparing home-based services for toddler-aged children with handicaps to center-based services (i.e., services provided in a classroom setting). Evaluation activities were augmented through the Early Intervention Research Institute. Although home-based services had been provided by the Illinois Division of Mental Health, conditions in the state grant to WOVSED required that all early intervention services be coordinated by WOVSED. Connie Luthe served as program coordinator for all early intervention activities reported in this paper.

Collaborative activities occurred for approximately two years. Originally, this study was a longitudinal study. During the second year of implementation, the following four primary concerns to the adequacy of this study as a longitudinal one were raised.

1. The degree of handicaps being identified were very mild. Many of the subjects barely qualified as needing intervention services. In effect, this made the subject sample more like a disadvantaged group than a handicapped group.
2. There was no availability of communication or motor therapies in either program. This was, at that time, considered a study drawback.
3. Originally, it was understood that EIRI would have input into future placement decisions for subjects. This was a misunderstanding. Students were placed into different programs under WOVSED control. These future placements also varied by intervention approach according to WOVSED sources.
4. There was uncertainty of degree of compliance in the home visit program. Home visit records were not sent to EIRI on a regular basis. This study may be closer to a treatment/no-treatment intervention.

Research activities were halted in November, 1987, due to these study concerns and by each of the collaborating agencies. Although a larger number of subjects had been identified and were participating in the project, this paper presents data only on those children who received pre- and post-assessments when collaborative activities halted.

Subjects

Twenty-six subjects are included in this study; 13 in each group. The home-based group consisted of 9 males and 4 females; the center-based group of 6 males and 7 females. All subjects had been identified as developmentally delayed according to criteria set by the state of Illinois. One subject in the center-based group had cerebral palsy. Subjects age at pretest ranged from 8 months to 31 months.

At the time collaborative activities halted, a total of 54 children had been pretested. Child intervention services were not affected by the termination of collaborative activities. Children remained in their respective early intervention placements.

Recruitment. Study requirements narrowed the eligible study population to children from two counties served by WOVSED. All children who were eligible for WOVSED-provided early intervention services in these counties were considered for inclusion in this study. Subject selection for this study was based on the severity of their handicapping condition as established by the Battelle Developmental Inventory (BDI; Newborg, Stock, Wnek, Guidabaldi, & Svinicki, 1984) and parent willingness for their child to be randomly assigned to a group. Children who scored 2.0 standard deviations or more below the mean on at least one of the major domains of the BDI, or 1.5 standard deviations below the mean on the total BDI, were eligible for the study. These criteria reflect those of the state of Illinois for receiving early intervention services. Parents of eligible subjects completed an informed consent procedure which stated that they were willing to allow their child to be randomly assigned to one of the program options, as well as which described other features of the study.

Assignment to group. Two facilities were established for the center-based program by county. Subjects were randomly assigned by county into either the home-based or center-based service program. Four levels of severity and three age breakdowns were established. The ages were: (a) 0-10 months, (b) 11-20 months, and (c) 21-31 months. Levels of severity were determined by Battelle total DQs and were: (a) severe, 0-52; (b) moderate, 53-68; (c) mild, 69-84; and (d) at-risk, 85+. Subjects were listed in each cell as parent permission to participate was obtained. The first placement in each cell was randomly determined, and placement alternated from that point.

Demographic characteristics. The majority of children included in this study were Caucasian, and all spoke English as their primary language. The families of these children lived in a rural area where parents worked in unskilled occupations or were unemployed. The mean yearly income for these families was below $15,000. The majority of parents had some high school education. Demographic information for subjects and their families, by group, are presented in Table 10.1. Groups were not different on any of the major variables assessed (at $\underline{p} \leq .05$).

Experimental Interventions

The two groups being contrasted are children who received either home- or center-based services. The following descriptions provide more information on these groups.

Center-based group. Subjects in this group received 5-day, 2-1/2 hour-per-day, programming in a classroom setting. Classrooms maintained an 8:2 child:staff ratio. Staff consisted of a certified teacher and a paraprofessional aide. Classrooms used a number of published curricula (e.g., the Hawaii Early Learning Profile) and emphasized instruction on developmental skills. Individual goals were established for each child based on a sequence of objectives that had been developed by the district. Teachers were responsible for program development for each student and for classroom schedules. Classrooms included social and group experiences in addition to time periods during which individual goals were addressed. Daily sessions typically included group activities for music and language development, free play, self-help skills development, and individual child goals.

The children in the classroom were offered an evaluation by occupational, physical, and language therapists, but these services were not provided directly in the classroom. Parents could contract privately for these services. Transportation to and from the classrooms was provided. Teachers kept parents informed of their child's progress through phone contacts and individual notes sent home. The center-based program operated for 9½ months, with a break from June 15 to August 15.

Table 10.1

Comparability of Groups on Demographic Characteristics for Wabash Intensity Study

	Home-Based			Center-Based				
	x̄	(SD)	n	x̄	(SD)	n	p Value	ES
• Age of child in months at pretest	24.1	(5.5)	13	22.7	(7.9)	13	.61	-.25
• Age of mother in years at pretest+	28.5	(5.7)	12	25.1	(5.3)	9	.18	.60
• Age of father in years at pretest+	31.9	(7.9)	12	27.4	(3.7)	11	.08	.57
• Percent Male*+	69.2		13	46.2		13	.25	.46
• Years of Education for Mother	11.5	(1.3)	12	11.6	(1.8)	9	.93	.08
• Years of Education for Father	11.5	(2.7)	11	12.3	(1.4)	12	.43	.30
• Percent with both parents living at home*	75		12	66.7		12	.67	.18
• Percent of children who are caucasian*	90.9		11	81.8		11	.56	.26
• Hours per week mother employed+	5.0	(14.1)	8	14.2	(19.5)	9	.29	.65
• Hours per week father employed+	33.0	(20.8)	8	26.3	(17.1)	12	.43	.32
• Percent of mothers employed as technical managerial or above*	0		10	0		9	1.0	.00
• Percent of fathers employed as technical managerial or above*	0		10	0		12	1.0	.00
• Total household income	$14,955	($7,521)	11	$11,417	($6,898)	12	.25	-.47
• Percent with mother as primary caregiver*	82		11	70.0		10	.55	.27
• Percent of children in daycare on a daily basis*+	18		11	0		11	.49	.30
• Number of siblings+	1.8	(1.1)	12	2.1	(1.9)	12	.61	.27
• Percent with English as primary language*	100		12	100		12	1.0	.00
				Average Effect Size =				***.21***

NOTES: * Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

** All p values are from t-tests conducted between groups.

$ $$\text{ES} = \frac{\bar{x}\text{ (center-based)} - \bar{x}\text{ (home-based)}}{\text{SD (Home-Based)}}$$

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Home-based group. Subjects in this group received once-per-week, 1-hour home visits by one of two early intervention program staff. The two home teachers were employed by the Illinois State Division of Social Services and had bachelor's degrees, but were not certified teachers. Home visitors were under the supervision of the special education district. Services focused on educating the parents on the needs of their child and helping them to access services such as medical care, etc. Individual education programs were established for each child and were implemented by the home visitor. The home teacher provided goals for the child and trained the parent in implementation of these goals. The home program provided services throughout the year. As with classroom-based services, parents were offered evaluation by therapists, but parents contracted privately for their services.

Treatment Verification

Verification of the independent variable should be an important aspect of all experimental research. The failure to obtain these data can potentially result in an erroneous conclusion (Barnett, Frede, Mobasher, & Mohr, 1987; Cooke & Poole, 1980). A variety of data were collected for treatment verification purposes. These included: (a) teacher ratings of parents' attendance, knowledge, and support; (b) a general health rating of the child by the parent; (c) an estimate of time parents spent working with their children on program-related activities on their own time; and (d) parent reports of hours of therapies and services received outside the program in which they were involved. All of these measures, except the estimate of parent time on program-related activities, was collected at posttest. The collection of parent time estimates is discussed later. T-tests were conducted with these data, and no differences were found between groups (Table 10.2).

Efforts were made to determine how much time parents in each group spent working with their child on enhancing the child's developmental growth. Parents were asked to return a preprinted postcard each week indicating the amount of time they had

Table 10.2

Treatment Verification Data for Wabash Intensity Study

	Home-Based			Center-Based					
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	t	ES[^]	P Value
Teacher rating of:[*]									
Parent Attendance	2.2	(.9)	10	2.2	(.8)	13	.13	.0	.90
Parent Knowledge	1.6	(.7)	10	1.7	(.5)	13	-.38	.14	.71
Parent Support	2.0	(.9)	10	2.2	(.7)	13	-.66	.22	.51
General Health[@]	2.2	(.4)	10	1.9	(.5)	12	1.39	-.75	.18
Total Hours Additional Services (Pre-Post)[#]	17.9	(47.2)	7	9.3	(23.8)	11	.45	-.18	.67

NOTES:[*] Teacher rating is based on a 3-point scale where higher scores indicate a better rating.

[@] Based on a parent rating of the child's health were 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[#] Data are based on parent report obtained at posttest. These data represent parent report of time the child received speech therapy, motor therapy, tutorial activities, and family receipt of social work services.

[^] Effect Size (ES) is defined here as the difference between the group means (Center-Based minus Home-Based) divided by the standard deviation of the Home-Based Group.

spent working on areas suggested to them by the early intervention program staff. Unfortunately, in spite of frequent follow-up requests, and the availability of incentives for returning postcards ,the number of cards returned was very low (less than 40%). Therefore, we were unable to specify with any degree of certainty the amount of time parents spent working with their child. Based on the postcards where were returned, and the judgement of early intervention program staff working with parents in both groups, it is our best estimate that the amount of time parents spent working with their children was not substantially different between the two groups, and, therefore, did not have an effect on the outcome of the study.

One type of treatment verification data not available for comparison is related to program attendance. Center-based classes were attended by children 83% of possible opportunities (SD = 13%). Data on attendance at home visits was not obtained on a consistent basis.

Parent satisfaction. Data about Parent satisfaction regarding the intervention program in which they participated are presented in Table 10.3. These data were obtained from an EIRI-developed questionnaire that uses a 4-point Likert-type scale (4 = highest satisfaction). Parents of children in the home-based group were significantly more satisfied with their child's intervention program in the areas of their participation in the program, the treatment program in general, and on a combined score of all questions from the parent satisfaction questionnaire. It should be made clear that all parents expressed overall satisfaction with their respective program; all scores but one were above 3 on the 4-point scale.

Site review. Another aspect of treatment verification is the site review. The purpose of this review was to collect information about the nature and quality of early intervention services that were being delivered, to verify that interventions were being implemented as intended, and to collect needs assessment data that may have been useful to the site. A site review visit was conducted in June 1987. Center-based classrooms were found to use appropriate assessment instruments and IEP goals were developmentally appropriate. Concerns were raised regarding the individualized lesson plans and child progress data.

The site review included the observation of a home visit to observe the home-based program. The home visit was observed to be a well organized and positive experience for the parent and child. The home teacher worked directly with the child and established excellent rapport with both the mother and child. She did not work with the mother in terms of direct instruction or ask the mother to participate in activities. The intent was that the parent learn from modeling. The home teacher conducted six different activities with the child, working on language, cognitive, and fine motor skills.

Administratively, teacher lesson plans in the center-based program were well prepared; a notebook for each child contained pertinent assessment information,

Table 10.3

Parent Satisfaction Data for Home-Based and

Center-Based Groups for the Wabash Intensity Study

	Home-Based			Center-Based					
Parent Satisfaction With:	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	t	ES^	P Value
Staff	3.8	(.4)	9	3.4	(.5)	10	1.70	-1.0	.11
Communication with Staff	3.7	(.5)	9	3.2	(.9)	10	1.35	-1.0	.19
Program Goals & Activities	3.7	(.5	9	3.6	(.5)	10	.29	0.2	.78
Parent Participation	3.7	(.5)	9	2.4	(1.1)	10	3.35	-2.6	.005
Range of Services	3.7	(.5)	9	3.2	(.6)	10	1.77	-1.0	.10
Progress of Child	3.7	(.5)	9	3.7	(.5)	10	-.15	0.0	.88
Program in General	3.8	(.4)	9	3.2	(.6)	10	2.28	-1.5	.04
Total	25.9	(2.3)	9	22.7	(3.6)	10	2.28	-1.4	.04

NOTES: ^ Effect Size (ES) is defined here as the difference between the group means (Center-Based minus Home-Based) divided by the standard deviation of the Home-Based Group.

objectives, and data collection forms. The folder samples from the home program were also well organized. All child folders contained IEPs and a Family Service Plan. Goals and objectives appeared appropriate; however, some were lacking evaluation criteria.

The summary of the site review indicated that intervention services were being appropriately delivered, but raised concerns regarding qualitative aspects of both service delivery formats. These concerns were related to "best practice" issues, as services being provided were appropriate.

Costs of alternate interventions. Cost data have not been prepared at the time. Data obtained from the site at the time collaborative activities ended was not sufficient to complete this analysis. Comparative cost data have been obtained from the Illinois Office of Education. These combined data sources are being used to determine cost estimates for this site. Analyses will be completed on these data.

Data Collection

Parents of each subject who participated in the study provided demographic information. All children were administered the BDI (Newborg et al., 1984). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. The BDI is being used to assess child outcomes for each of the studies being conducted by EIRI. This measure was selected for use based on the findings of an expert panel convened to help EIRI determine appropriate measures. (More information on the BDI and other EIRI measures may be found in the EIRI 1987/88 Annual Report.)

Parents of children in the study completed the following scales of family functioning: Parenting Stress Index (PSI; Abidin, 1986), Family Resource Scale (FRS; Dunst & Leet, 1985), and the Family Support Scale (FSS; Dunst, Jenkins, & Trivette, 1984). These measures assess, respectively: parent stress, family resources, and family support. These family measures are part of a core battery of instruments used by EIRI. As discussed earlier, family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although, theoretically, it is assumed early intervention will effect families (Bronfenbrenner, 1977), the specific areas that may be impacted are unknown and may vary depending on type of intervention. The battery of family functioning measures used here will help to elucidate areas of functioning that may be affected.

The BDI and the above parent measures, including demographic information, were administered at pre- and posttest sessions. In addition, the Minnesota Child Development Inventory (MCDI; Ireton & Thwing, 1972) was administered at posttest. This test was selected because it is completed by the parent, and, where home-based services were provided at home, it was possible that child improvements may have been more prominent in the home setting rather than when exhibited in a structured test situation. The MCDI assesses seven areas of development: general development, gross motor skills, fine motor skills, expressive language, comprehensive communication, situational comprehension, self-help skills, and personnel-social skills. In addition, the Family Inventory of Life Events (FILE; McCubbin, Patterson, & Wilson, 1983), and the Family Adaptability and Cohesion Evaluation Scales (FACES; Olson, Portner, & Lavee, 1985) was administered to further assess family functioning. These measures assess, respectively, occurrence of recent significant life events, and functioning of the family in respect to an "ideal" family.

Recruitment, training, and monitoring of diagnosticians. The rural nature of this project made recruitment of diagnosticians difficult. All pretesting was administered by the local contact person. All children were administered the BDI prior to enrollment in the study. This procedure was determined to be most time effective for this site. Mothers completed the family measures and the demographic form following the administration of the BDI. The research study was discussed with parents of children who were determined eligible for intervention services. If interested, they were given an informed consent form to complete. Once in the study, parents were offered an incentive of $20 for completing the pretest battery.

All posttests were administered by a diagnostician other than the site contact to ensure that the diagnostician was unaware of subject group placement. The procedures were the same as those used at pretest, with the addition of the parent completing the MCDI, FACES, and FILE. Parents were again given an incentive of $20. Both pre- and posttesting occurred at a center that was centrally located to all programs but not involved in the study. This ensured that the testing setting was equally familiar for all subjects.

All EIRI diagnosticians, including the site contact, were required to pass an EIRI designed diagnostician certification course prior to administering tests to subjects. The certification involved a demonstration of competency with the BDI and familiarization with EIRI procedures.

Pretest. Subjects involved in this study were enrolled on a continuous basis. That is, as children were referred for assessment for placement in intervention services, they were tested and, if appropriate, enrolled in the study. Children were initially identified for placement in this study during the latter part of the 1985/86 school year. Children continued to be identified through the summer and the initial part of the 1986/87 school year.

This continuous enrollment did effect those children identified in May through August 1986 who were selected for enrollment in the center-based group. As the center-based classrooms did not operate in the summer, these children did not begin intervention until August 1986. The home-based program occurred throughout the year.

Posttest. The first, and only, posttest occurred in May 1987. Only children who had been enrolled in intervention for a minimum of 6 months were scheduled for posttesting. Some children were tested prior to May 1987, as they became eligible for preschool-aged intervention services. Children who had been enrolled in the research, but are not included in this study, had been scheduled for posttesting in May 1988. The halting of collaborative activities prevented the occurrence of future posttesting.

Results and Discussion

This study examined the effects of home-based versus center-based intervention services to toddler-aged children with handicaps on the children and their families. The following sections present results and a brief discussion of results. A more general discussion follows this section.

Comparability of Groups on Pretest Measures

Group differences on pretest measures were compared using t-tests and are presented in Table 10.4. Subjects in the home- and center-based groups were comparable on all BDI domains, on the BDI total score, and for chronological age of child at pretest. Parents of subjects in the center-based training had more child-related stress than parents of subjects in the home-based training group, based on one PSI domain. Although this result approached significance ($p = .09$), other PSI domains (other stress and total stress) did not support the finding. Family support (FSS) and resources (FRS) were comparable. These results suggest that the groups were comparable at pretest.

Measures of Child Functioning

Results of posttest data analysis on child functioning are presented in Table 10.5, which shows the effects of alternate forms of intervention on measures of child functioning. Results presented for each measure in Table 10.5 are based on an analysis of covariance completed using SPSS-PC. Covariates represent pretest score for each of the BDI domains and the pretest BDI total score for the MCDI domains. Maturation (defined as age at posttest minus age at pretest) was also used as a covariate in cases where it increased statistical power.

The results of the analyses reported in Table 10.5 demonstrate statistically significant effects of intervention on the personal-social and communication domain of the BDI and the total BDI score and a trend toward significance ($p < .10$) for the BDI cognitive domain. All group differences favored the center-based training group. Effect sizes suggest educational significance to accompany the findings of statistical significance.[1]

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[1] *Analyses were conducted which controlled for length in intervention on the results. The impact of the results presented was not altered by these analyses.*

Table 10.4

Comparability of Subjects on Measures of Child and Family Functioning for the Wabash Intensity Study

	All Subjects Included in Analysis							
	Home-Based			Center-Based				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[$]
• Age of child in months at pretest	24.1	5.5	13	22.7	7.9	13	.81	-.25
• **Battelle Developmental Inventory BDI)**[+]								
DQs for:								
Personal-Social	72.6	24.6	13	71.8	20.0	13	.63	-.03
Adaptive Behavior	83.3	17.1	13	75.1	26.2	13	.20	-.48
Motor	88.5	14.3	13	87.0	23.9	13	.35	-.10
Communication	68.5	19.5	13	65.9	17.0	13	.40	-.13
Cognitive	76.6	15.0	13	73.4	17.6	13	.40	-.21
TOTAL	79.8	12.6	13	77.1	16.1	13	.35	-.21
• **Parenting Stress Index (PSI)**[#]								
Child Related (range 50 to 250)	111.8	16.0	12	128.6	30.3	13	.09	-1.05
Other Related (range 54 to 270)	141.7	14.1	12	144.5	34.2	13	.79	-.20
TOTAL (range 101 to 504)	254.3	22.8	12	273.1	62.2	13	.33	-.82
• **Family Resource Scale (FRS)**[&] (range 30 to 15)	105.3	15.6	10	115.5	17.1	12	.16	.65
• **Family Support Scale (FSS)**[&] **Total Score** (range 0 to 4)	1.0	.7	9	1.2	1.0	12	.74	.29

NOTES:

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[&] Analyses for the FSS and FRS are based on raw scores, indicating number of supports or resources indicated by the family as being available. For the FSS, the score represents the sum of perceived support divided by the number of reported sources of support. Higher scores are considered better.

[#] Analysis for the PSI is based on raw scores. Lower scores are considered better.

[$] $ES = \frac{\bar{x}\text{ (center-based)} - \bar{x}\text{ (home-based)}}{\text{SD (Home-Based)}}$

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Table 10.5

Posttest Measures of Child Functioning for Home-Based and Center-Based Groups for the Wabash Intensity Study

		Home-Based				Center-Based						
Variable	Covariates#	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	ES^	p Value
Average length of intervention in months&	–	7.9	(2.8)	—	13	8.4	(1.3)	—	13	1.12	.19	.30
Age in months at posttest	–	32	(7)	—	13	33	(8)	—	13	.06	.14	.83
Battelle Developmental Inventory (BDI)*												
Personal-Social	1, 7	75	(20)	72	13	82	(23)	84	13	6.63	.70	.02
Adaptive Behavior	2	61	(10)	58	13	57	(12)	59	13	.23	.10	.64
Motor	3, 7	83	(11)	80	13	80	(21)	83	13	1.21	.27	.28
Communication	4, 7	39	(8)	38	13	41	(8)	42	13	4.41	.50	.05
Cognitive	5	25	(5)	32	13	23	(6)	36	13	3.31	.80	.08
Total	6, 7	290	(53)	276	13	295	(68)	309	13	14.78	.62	.001
Minnesota Child Development Inventory (MCDI)*												
General Development	6	84	(16)	79	9	80	(28)	85	10	.62	.38	.44
Gross Motor	6	26	(4)	25	9	24	(7)	25	10	.01	.00	.91
Fine Motor	6	31	(3)	30	9	31	(4)	32	10	1.68	.67	.21
Expressive Language	6	41	(7)	39	9	39	(12)	41	10	.23	.29	.64
Comprehensive Communication	6	30	(11)	27	9	32	(14)	35	10	3.18	.73	.09
Situational Comprehension	6, 7	28	(7)	26	9	30	(9)	32	10	3.21	.86	.09
Self-Help	6	26	(4)	24	9	23	(8)	24	10	.00	.00	.98
Personal-Social	6	24	(7)	22	9	25	(8)	26	10	1.89	.57	.21

NOTES:

* Statistical analysis for BDI and MCDI scores were conducted using raw scores for each of the scales.

^ Effect Size (ES) is defined here as the difference between the groups (center-based minus home-based) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Home-based Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

& Enrollment in intervention was continuous throughout the year. Therefore, some children that were pretested immediately prior to or during the summer and who were selected for the center-based option did not begin receiving services until August. This measure represents actual time the program was in effect.

# Covariates: 1 = BDI Personal-Social; 2 = BDI Adaptive Behavior; 3 = BDI Motor; 4 = BDI Communication; 5 = BDI Cognitive; 6 = BDI Total, 7 = Maturation (age at posttest - age at pretest).

Parent reports of child development, based on the MCDI, did not find significant differences between the groups. Parents did observe a trend toward a difference on the MCDI subscales of comprehension-communication and situational comprehension in favor of the center-based group. This finding, combined with the effect size, suggests a meaningful difference in these skill areas. Also, these findings provide additional support to the communication skills differences found on the BDI.

When using a sample size as small as that used in this study, findings of statistical significance with a $p < .10$ suggest that groups were impacted differentially. These differences are clear in all areas except motor and adaptive behavior skills. Although the MCDI did not show significance, except on two domains, the average ES for the MCDI was .44. This indicates a positive impact in favor of the center-based group. If you do not include the gross motor and self-help domains (because they are not supported by the BDI findings), the average ES is .58. Overall, these findings strongly suggest group differences, in favor of the center-based group, occurred as a result of intervention.

Measures of Family Functioning

Table 10.6 presents the effects of intervention on measures of family functioning. Analyses of covariance was used for the PSI. Analysis of variance was used with other family measures as covariates were not found which would strengthen analysis. Except for the FILE, no differences between the two groups were found on measures of family functioning and parent stress. These results suggest that the alternate forms of intervention did not have a significant effect on parent stress, family resources, or perception of family toward an "ideal." The significant result from the FILE is difficult to interpret. The finding indicates more significant life events occurred to parents of subjects in the center-based training.

Conclusions

This study demonstrated that a center-based model, early intervention program for toddler-aged children who were handicapped was more effective than a less intensive home-based model program. These results address some concerns that have been raised regarding the intensity of early intervention services (e.g., Casto & Mastropieri, 1986). More intensive services provided to children with handicaps who were less than 36 months of age was effective in producing statistically significant and educationally meaningful developmental gains on measures of child functioning. These interventions appeared to have no differential impact on parent stress levels or family functioning. Parents of subjects in the center-based group were found to have more significant life events occur to them while their child was

Table 10.6

Posttest Measures of Family Functioning for Home-Based and Center-Based Groups for the Wabash Intensity Study

	Home-Based					Center-Based							
	x̄	(SD)	Adj. x	%ile[**]	n	x̄	(SD)	Adj. x	%ile[**]	n	ANOVA F	ES[^ ^]	Value
Parent Stress Index (PSI)[$$]													
Child Related	108.2	(14.5)	113.9	80	10	114.7	(26.7)	109.6	75	13	33	.30	.57
Other Related	141.7	(20.1)	142.2	81	10	140.0	(30.8)	139.5	75	13	31	.13	.59
Total	250.5	(22.1)	256.9	84	10	254.7	(54.6)	248.3	78	13	72	.39	.41
Family Support Scale (FSS)[*]	1.5	(.7)	---	---	9	1.9	(.8)	---	---	13	1.84	.57	.19
Family Resource Scale (FRS)[+]	108.2	(25.1)	---	32	10	111.1	(13.8)	---	37	13	.12	.12	.72
Family Adaptation and Cohesion[^] Evaluation (FACES)													
Cohesion	3.8	(2.3)	---	---	11	3.5	(4.2)	---	---	12	.04	-.21	.85
Adaptation	3.5	(2.1)	---	---	11	4.3	(2.9)	---	---	12	.49	.13	.49
Total	5.9	(2.0)	—	—	11	6.4	(3.8)	—	—	12	.34	.11	.57
Family Inventory of Life Events (FILE)[$]	10.7	(5.3)	—	34	11	17.0	(5.6)	---	10	11	7.38	-1.19	.01

NOTES:

[^ ^] Effect Size (ES) is defined here as the difference between the group means (center-based minus home-based) divided by the unadjusted standard deviation of the Home-based Group. For the PSI and FACES, the numerator for the ES was calculated as: Basic-Adjusted, as lower scores are preferred. For the PSI, the ANCOVA adjusted scores were used in the ES.

[$$] Analyses for the PSI are based on raw scores. Lower scores are considered better. Results are based on an Analysis of Covariance where pretest domain scores for each domain served as the covariate.

[*] Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

[^] Scores for each subscale of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[$] Analysis for the FILE is based on raw scores. Lower scores are considered better.

[+] Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

[**] Although analyses were based on raw scores, percentile information is presented for ease of interpretation on the PSI, FRS, and FILE. Percentile information is based on the raw score or adjusted raw score and was obtained from data collected across all EIRI longitudinal studies for the FRS. Percentile information for the PSI and FILE are based on the authors' normative sample. For the PSI, higher percentiles indicate greater stress; for the FILE, higher percentiles indicate lower stress.

enrolled in intervention. This finding cannot be readily explained by the data collected as part of this study.

An issue indirectly addressed by this study is related to differences in program structure as well as intensity. It is evident that the interventions used in this study differed in structure as well as intensity. In fact, it would be difficult, and inappropriate from an intervention perspective, to provide the same structure when the intensity difference is 1:12.5, as it was in this study. In some respects, though, the programs were similar. Children in both groups had individual program plans developed using the same assessments, and the early interventionist (teacher or home visitor) was the responsible person for addressing child goals. Other aspects of the programs differed, and such differences can only be expected based on the two different models used.

If the structure of programs, as well as intensity, becomes the major concern of research efforts, then it behooves researchers to develop instruments for assessing process variables. Such an instrument has been developed for preschool classrooms (Carta, Sainato, & Greenwood, 1988) and adapted for use in toddler-age classrooms (Atwater, Welge, & Rider, 1988). A similar instrument is needed for use in the home-based model. This type of instrument would greatly aid research that has occurred on frequency of visits (Burkett, 1982; Lowitzer, 1989; Mott, 1989; Sandow et al., 1980), such that frequency alone is not the only known dependent variable. Effective processes, once identified, could then be compared across models.

The results of the treatment verification data raise an interesting point. It was found that there were no group differences on parent reports of time spent working at home with their child, on their own, on what parents considered program related activities. Parents in the home-based group reported spending 210 minutes/week (S.D. = 361) vs. 211 minutes/week (S.D. = 235) for the center-based group (t

= .07, P = .94). This clearly violates the assumption behind the home-based model, which suggests activities parents learn during home visits will be done regularly without the presence of the home visitor. If parents do not comply with this assumption, then the child outcomes of this research are not surprising.

The question that must be asked then is: Were these parents different from or typical of parents who are enrolled in home-based programs? Parents can be encouraged to do activities at home (e.g., Shearer & Shearer, 1976). High rates of parent activities are generally noted with home-based model, demonstration-type projects. Other research has demonstrated that parents are unwilling to regularly engage in activities they see as structured (Culatta & Horn, 1981; McDonald, Blott, Gordon, Spiegal, & Hartman, 1974). In the interim report of the Sandow et al. (1980) study (Sandow & Clark, 1978), it was hypothesized, based on their finding that less frequently visited children were showing greater improvement, that the less frequent visits forced parents to rely more on themselves rather than waiting for, and relying on, the home visitor to do everything for the parents. Regardless of parent motivation (or lack of it), it is clear that the involvement of parents in their child's program, when the home trainer is not there, requires greater emphasis in research and practice.

The importance of parent satisfaction in early intervention programs has been proposed as a variable of great importance (Strain, 1988). Clearly, consumer satisfaction must be considered in any program. The results from the parent satisfaction data in this study indicate that the parents whose children made less progress were more satisfied with their program. Philosophically, it must be asked, is the goal of early intervention to increase child outcomes or to satisfy parents (perhaps empowering them; Dunst, 1986). Both are reasonable goals, and they are not mutually exclusive. The failure of other family and parent measures used in this study to demonstrate any group differences to support the parent satisfaction findings also raises questions about the adequacy of measures assessing parents and families as they are being used in early intervention research.

Three major weaknesses are also apparent in this study. One is related to the degree of handicap exhibited by the children. The majority of subjects in this study, although qualifying for handicap services according to State of Illinois guidelines, were mildly handicapped. A similar comparison involving moderately to severely delayed children may have resulted in other findings. A second weakness is related to the lack of treatment verification data that deals with attendance at home visits. The failure to obtain these data requires that conclusions be guarded because of the potential for erroneous conclusions. The final weakness is that the research is not longitudinal. It is not known if, or for how long, these child outcome differences will endure. As with the Sandow et al. (1980) study, initial difference may not maintain in future years.

This study does suggest that center-based model services for toddler-aged children with mild handicaps can be effective and was more effective than a home-based model service option. Support is provided to the contentions that "more intense is better" and that center-based model services provided at the toddler ages can be effective. Also, varying interventions can differentially effect toddler-aged children, suggesting that the age-at-start issue must be examined in light of interventions known to be the most effective. It is clear that this is only one of many needed studies to help complete the puzzle regarding knowledge of early intervention efficacy. From a practical perspective, this study suggests that more intensive center-based model services appear to be the preferred service option for toddler-aged children with mild handicaps. This information needs to be considered by decision makers when requesting funding and by those training early interventionists.

Future Plans

Due to the termination of collaborative activities, there are no future plans. Intervention is complete, and follow-up of subjects is not feasible.

BELLEVILLE PROJECT

Project #11

COMPARISON: Mildly to Severely Handicapped Children--Treatment vs no treatment

LOCAL CONTACT PERSON: Kathleen Cullen, Program Director

EIRI COORDINATOR: Kathryn Haring (10/85 - 9/87); Martin Toohill (10/88 - 10/89)

LOCATION: Belleville, Illinois

DATE OF REPORT: 10-9-89

Rationale for the Study

Although there is a widespread belief that early intervention will have beneficial effects for handicapped children, very little well designed research exists to support this belief. Almost all of the existing research is either poorly designed (see Dunst & Rheingrover, 1981, for a discussion of the methodological shortcomings with existing research with children with disabilities), or done with disadvantaged children (e.g., Ramey & Haskins, 1981; Berrueta-Clement et al., 1984). In spite of the paucity of research evidence, program administrators must still make decisions about whether to provide early intervention services, and if so, what type of services and what intensity of services to provide. Although a single study cannot answer such a complex question, it is important to begin establishing an empirical basis to guide programmatic decisions about early intervention. The purpose of this study was to compare the effects on child and family functioning variables for preschool children with handicaps who received home-based early intervention services with those who received no home-based services.

Review of Related Research

Few, if any, early intervention studies have been done with children with handicaps which make a treatment versus not treatment comparison. Studies which have examined the effects of different intensity levels of intervention are certainly relevant to the issue. If early intervention has a beneficial effect, it seems reasonable that the more intensive the intervention, the greater will be its impact. Unfortunately, very few studies have been identified that directly tested this assumption among children with handicaps. In a study by Sandow, Clarke, Cox, and Stewart (1981) using a quasi-experimental design, severely intellectually handicapped children were matched and assigned to either a high intensity (2-3 hours every two weeks) or low-intensity (2-3 hours every two months) home-based intervention and compared to a no-treatment control group. Outcome IQ measures were obtained by the authors. While the high-intensity group demonstrated greater IQ gains after one year (ES = 0.55), the low-intensity group equalled the high-intensity group in terms of IQ gain in the second year of the study. There was no difference between the two groups after three years. Both groups made greater gains than the no-treatment control group after three years (ES = 0.47 and 0.37, respectively).

In a study by Jago et al. (1984), 24 language-delayed children aged 18-36 months were matched for age and etiology (all but two were diagnosed as having Down Syndrome) and assigned to one of two levels of a center-based intervention. The high-intensity intervention group received 7.0 hours of weekly services in which total communication was stressed continuously and parents and children were encouraged to engage in exploratory play activity. The low-intensity intervention group received an average of 2.5 hours of weekly service in which total communication was taught for only 5-10 minutes per session. After seven months of treatment, children in the high-intensity group increased their number of acquired signs fivefold while the low-intensity group increase was only sixteen percent. However, there were no statistically significant differences on a developmental measure. In addition, the authors noted that the high-intensity intervention was confounded with the greater number of teacher hours subjects received in that group.

The above two studies illustrate methodological shortcomings of early intervention efficacy research as described by White and Casto (1985)--experimental designs were not randomized, data was not impartially obtained, there was no description or documentation that the intended treatments were actually delivered, and, at least in the Sandow et al (1981) study, there was no discussion of whether the outcome measure used (IQ) was the most appropriate. Regardless of the results, these threats to the internal validity of the experiments make it difficult if not impossible to draw any firm conclusions. In summary, little empirical data exists that clearly supports or refutes the assumption that more preschool intervention programs for children with handicaps will positively affect developmental progress.

Overview of Study

This study addressed some of the deficiencies listed above. Children ranging in age from four months to 29 months with a variety of handicapping conditions were randomly assigned to either a home-based intervention condition (treatment group) or a no intervention condition (control group). Children in both groups were assessed by "blind" diagnosticians over a period of 9-13 months using a standardized developmental measure to assess the efficacy of the intervention.

Methods

The Belleville Project was conducted by a private state-funded facility in Illinois that offered services to individuals with handicaps from birth to 21 years of age. There were vocational work and classroom programs at the site. The home-based treatment program provided services to children birth to 3 who were identified as handicapped. A home teacher or intervenor served as the coordinator of the home-based program which served a two-county, primarily rural, Caucasian population. Funding for this home-based intervention, the only section of the agency's program that participated in this longitudinal study, was provided by a grant from the state of Illinois as a part of the Preschool Pilot Program funding initiative. Prior to this state funding, the facility only offered center-based intervention and many birth to 3-year-old children in this rural area did not receive services.

Subjects

As a part of this research project, the facility expanded services to two counties in which no early intervention services were being provided for children 0 to 3. County-wide screenings were conducted with a goal of identifying 60 mildly to severely handicapped infants and toddlers between these ages. Originally, state money was provided for the purpose of offering services to a random half of these subjects, i.e., 30 children. Justification for doing a randomized study was that there would be more children who needed services than available financial resources to provide those services. Therefore, random assignment to groups was a fair way to decide which children would receive services. However, after more than one year of extensive recruitment efforts, only 24 children had been recruited for the study, 12 of whom received services. At that point, the state funding agency decided that it could no longer justify withholding direct services from the control group since there was sufficient money to provide full services to all the children who had been identified. The decision was made to terminate the comparative research and provide full services to all children.

Assignment to groups. Identified subjects were randomly assigned to either the treatment or control groups. For each child included in the study, parents signed a consent form agreeing to participate in either the treatment or control conditions.

Group assignment took place in two stages. Subjects were stratified according to age and severity of handicap (mild, moderate, or severe) and then randomly assigned. Assignment procedures are explained in more detail in the 1986-1987 Annual Report. Group assignments were made by the EIRI coordinator to ensure that no program staff had knowledge of where a particular incoming child would be placed.

Subject attrition. The home-based treatment had been implemented for only seven months when the comparative study was terminated due to low enrollment. At that time, all subjects were posttested. Because not all subjects had been pretested at the same time, with some having been pretested five months before the actual start-up of the treatment, there was a range of pretest-posttest intervals (3-13 months). It was decided that a nine-month pretest-posttest interval was the minimum amount of time to assess significant developmental change as well as to assess any effects of the intervening treatment program. Three subjects did not meet this criterion. A fourth subject had moved and could not be located for posttest. Thus, of the 24 subjects recruited for the study, only 20 were included in the posttest analysis.

The pretest mean BDI scores of the four subjects not included in the posttest analysis (three Controls, one Treatment) were virtually identical to the pretest mean BDI scores of the 20 subjects who were included. Also, the individual pretest scores of these four subjects did not significantly deviate from the pretest mean scores of the respective group to which each of the four subjects had been assigned. Thus, it appears that the 20 subjects included in the posttest analysis were comparable to the original sample of 24 at least in terms of pretest BDI scores. The handicapping conditions for these 20 children are listed in Table 7.1.

Demographic characteristics. For the 20 subjects who were post-tested, 19 were Caucasian and one was Black. Income ranged between $15,000 and $20,000 annually. The mean number of years of education for mothers and fathers was 12.7 and 13.1, respectively. The subjects primarily resided in rural areas of western Illinois. Descriptive data for subjects who were included in the posttest analysis are

Table 7.1

Frequency of Handicapping Condition for Belleville Project

	Subjects Included in Posttest Analysis	
Variable	Control Group	Treatment Group
Motor Impaired	1	0
Language Impaired	1	2
Developmental Delayed	5	4
Multihandicapped	2	1
Cerebral Palsy	0	4
TOTAL	9	11

presented in Table 7.2. Incomplete data for the father-related variables was attributable to the fact that some subjects from both groups came from households in which the father was not present.

The only variables for which there were statistically significant differences ($p < .10$) between groups were the number of siblings and the percent of fathers employed in technical/managerial positions. Given the number of statistical tests of significance conducted, one expects some group comparisons that are statistically significant even if the null hypotheses were true. At the same time, with the small number of subjects in this study, the power to detect statistically significant differences if the null hypothesis were not true is minimal. An examination of the effect sizes for the posttested subjects in Table 7.2, some of which are positive and some negative, suggests that any group differences were due mostly to sampling fluctuation and that the groups were comparable demographically.

Experimental Interventions

The services provided to the treatment and control groups are described below.

Treatment group. The intervention consisted of twice-weekly home visits in which the Teaching Research Curriculum in combination with the Portage and Carolina

Table 7.2
Comparability of Groups on Demographic Characteristics for the Belleville Project

	Subjects Included in Posttest Analysis							
	Control Group			Treatment Group				
Variable	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p Value	ES[$]
• Age of child in months as of 7/1/87	25.4	5.4	9	28.7	9.6	11	.54	.61
• Age of mother in years	32.2	5.3	9	32.8	7.6	11	.84	.11
• Age of father in years	33.4	6.9	9	32.9	3.2	9	.84	.07
• Percent male[*]	67.0		9	82.0		11	.46	.28
• Years of education for mother	12.0	2.6	9	13.2	2.6	11	.33	.46
• Years of education for father	12.6	2.6	9	13.6	2.5	9	.42	.38
• Percent with both parents living at home[*]	89.0		9	82		11	.68	-.12
• Percent of children who are Caucasian	100.0		9	91		11	+	.18
• Hours per week mother employed	16.0	19.2	9	8.6	15.5	11	.35	.39
• Hours per week father employed[++]	31.3	19.4	8	26.7	18	9	.62	.24
• Percent of mothers employed as technical/managerial or above[*]	0.0		9	27		11	+	.53
• Percent of fathers employed as technical/managerial or above[*][++]	56.0		9	13		8	.07	-.72
• Total household income[^]	$21,611	$12,046	9	$15,273	$13,504	11	.25	-.54
• Percent of children in day care more than 5 hours per week[*]	0.0		9	18		11	+	.37
• Number of siblings	2.2	1.4	9	1.0	0.9	11	.03	.86
• Percent with English as primary language	100.0		9	100.0		11	+	0

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scores "1," and those not possessing the trait were scored "0."

[^] Income data were categorical and were converted into continuous data by using the midpoint of each interval.

[+] One or both groups had no variance.

[++] Some data unavailable.

[$] Effect sizes (ES) for continuous data were estimated as follows: $ES = \bar{X}_e - \bar{X}_c + S_c$. Positive ESs were for differences in favor of the intervention group when appropriate (e.g., household income).

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curricula were used. Content of each home-based session was based on (a) recommendations made by a multidisciplinary assessment team, which typically included a psychologist, speech/language pathologist, OT/PT, educator, and the child's parent, and (b) the child's progress over time. An Individual Habilitation Plan (IHP) was developed for each child based on this information and was used to guide the intervenor in working with the parent during intervention. A variety of assessment instruments and curricula were used to develop the specific objectives in the IHP.

The home intervenors were trained in a nondirective family-oriented approach. The Belleville project provided inservice training of staff conducted by local professionals and outside experts. The home intervenors kept detailed documentation of each home-based session. Their files included all necessary information, well developed IHPs, and family treatment plans. The home visits were conducted in two weekly sessions with a total duration of approximately 3 to 4 hours per week. Intervention was based on individual needs of the families and the targeted child. For example, some families were in need of knowledge of child development and assistance in setting expectations for their child with disabilities. The home intervenors provided the necessary information and spent a portion of the visit encouraging the child's parent to express their needs, concerns, and frustrations. In some cases, the intensity of the intervention with the parent was equal to the intensity of the intervention with the child. The treatment philosophy was based on meeting the needs of both the child and the parent(s) within the framework of family systems theory (Haley, 1976).

The intervention with the child was carried out with the parents as involved as possible, by observing and learning. The home intervenors instructed parents in methods, strategies, and knowledge for working with their own child. The direct programming for the children was individualized and based on developmental sequences.

Activities were designed and implemented to meet individual goals set in the areas of language/communication, gross/fine motor, cognitive, self-help, and family needs.

The schedule of a home visit included: a warm-up play period; discussion of current concerns and child's status; direct 1:1 programming designed to meet specific objectives; work with the parents; discussion of progress made towards objectives and data recording. When ending the visit, the teacher reminded the parent of the next visit and of any planned activities. Data sheets, program descriptions, detailed instructions, and materials were left for the parent to use, and the parent was given encouragement and praise. In some cases, the only data recorded by parents was whether or not the activity took place or how well the activity proceeded. For example, in a feeding program, the key data recorded was that the child was successfully positioned or that the child consumed two ounces of food orally.

The intervenors kept detailed data on number of trials, correct response and error rates, and a specific description of what progress took place towards each objective. Their anecdotal records described the session, the parent's and child's response, and plans for the next session. The IHPs were evaluated on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary by the multidisciplinary team. During the site visit by the EIRI coordinator, 10% of the IHPs were randomly sampled and evaluated and found to be age appropriate, developmental, and functional in nature.

The project also offered a twice-monthly sharing group and a twice-monthly support group. The sharing group was informational in nature, with parents instructed on different issues related to child development and handicapped conditions. The support group was more informal, with parents discussing their immediate needs and concerns.

Control Group. Children in the control group were pretested and posttested. They received no direct services during the pretest-posttest interval except for any additional services that their parents sought for them outside of the project. The home intervenors placed monthly phone calls to the parents of each child in this group to maintain contact with the family and to ensure their continued participation in the study. Parents were invited to the twice-monthly sharing and support groups described above.

Treatment verification. A number of procedures were used to verify that treatment was being implemented as intended. They included weekly contacts with the site and three site visits to assess the quality of the intervention. The following additional data were collected:

1. ***Collection of attendance data.*** The child's participation in the program was recorded according to the length of the session, the staff involved, the number of home visits, and the length of intervention in months. Nonattendance at regularly scheduled sessions was also recorded according to the reason for nonattendance (e.g., child illness, holiday, etc.). Attendance averaged over 80%; all missed sessions were rescheduled for make-up. As presented in Table 7.3, the mean number of home visits was 32.5, with a range of 14 to 50 visits, while the mean length of intervention was 5.5 months, with a mode of 7 months and a range of 3 to 7 months.

Table 7.3

Intensity of Treatment and Additional Services for Posttested Subjects for Belleville Project

	Control Group			Treatment Group			
Variable	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p
Mean number of home visits				32.5	15.1	11	
Mean length of intervention in months				5.5	1.9	11	
% of Subjects Receiving > 10 Hours Additional Treatment Services[1]	33%		9	27%		11	.78

[1] These include speech therapy, physical therapy, and preschool services.

2. ***Annual teacher evaluations.*** Annual teacher evaluations were conducted by the administrative director. Results of the evaluations indicated that the teachers were highly competent, qualified, and performed at a high level of excellence.

3. ***Additional services data.*** Additional services data were collected to assure that there were true differences between groups in services received. While some subjects in each group did receive either additional speech, physical, or preschool services, it can be seen in Table 7.3 that there was no difference in the percent of subjects in each group receiving additional services. Furthermore, the number of hours for those subjects who did receive additional services was generally comparable across groups.

Finally, while formal records were not kept, it was reported by project staff that it was mostly parents of the treatment group who attended the parent support and sharing groups. Thus, this project approached becoming a truly randomized treatment-no treatment study.

Site Visit

Information gathered during the three on-site visits by the EIRI coordinator was used to evaluate the intervention program. This information included observations of home visits, review of subject folders, and observations of training sessions. The project site coordinator completed a Program Verification packet, as did the EIRI site coordinator.

The results of the on-site evaluations indicated that each child had an appropriate and current IHP. Both home intervenors developed detailed lesson plans, with data collection systems that were observed being implemented in the home visits. Family treatment plans that documented family needs, long- and short-range goals, medical problems, and special services that the child or family received were also reviewed. These plans were reviewed quarterly and revised as needed.

The staff were observed providing good modeling for both children and family members. The staff acted as a resource to the families and provided strategies aimed at improving parent-child interactions. Staff provided a great deal of positive reinforcement and especially reinforced small increments in skill development. It was evident that the intervention had been implemented as planned.

Data Collection

***Recruitment, training and monitoring of diagnosticians*.** Two diagnosticians were trained to administer pretest and posttest Battelle Developmental Inventories (BDI). One diagnostician had a master's degree in psychology, the other had a bachelor's degree and experience as a parent-infant educator. Both diagnosticians were "blind" to the child's group assignment and the research design. Ten percent of the BDIs were "shadow scored" by the EIRI site coordinator with interrater reliabilities of 90% obtained.

***Pretesting*.** Parents of each child participating in the study completed an informed consent form and provided demographic information. Children were administered the BDI. Parents completed the following measures: the Parenting Stress Index (PSI), which assesses stress in the parent-child system; the Family Support Scale (FSS), which assesses different sources of support available to families with young children; the Family Resource Scale (FRS), which measures different kinds of resources available to the family; the Family Inventory of Life Events and Changes (FILE), which measures life events and changes experienced by the family during the previous 12 months; and the Family Adaptability and Cohesion Evaluation Scales (FACES III), which assess the separateness or connectedness of the family members to the family. BDI testing occurred at a center which was centrally located to the program. This ensured that the test setting was equally unfamiliar to all subjects. The primary caretaker completed the family measures following the administration of the BDI. The diagnostician completed a testing report and transmitted all data to the EIRI site coordinator.

Posttesting. Posttest BDIs were collected after children had been enrolled in the program (pretest-posttest interval) for a minimum of 9 months and a mean average of 11.

Results and Discussion

Comparability of Groups on Pretest Measures

The pretest data were carefully scored and checked prior to being analyzed. It can be seen in Table 7.4 that, for BDI scores, there were no statistically significant differences between treatment and control groups, although control subjects slightly outperformed treatment subjects on most measures. Among family measures, there were also no statistically significant differences ($p < .10$) between groups on any of the measures. As with the group comparisons on the demographic variables, the scatter of positive and negative effect sizes of various magnitudes on the BDI and family measures suggests that any group differences were mostly due to sampling fluctuation and that the groups were basically comparable on these measures at pretest.

Posttest Measures of Child Functioning

The posttest BDIs were scored and checked prior to data analysis. Mean scores for each of the BDI domains were compared using an analysis of covariance (ANCOVA), which increases the statistical power to detect differences between the sample group means. The pretest BDI total raw score was used as the covariate for all comparisons, accounting for anywhere between 69% and 84% of the variance of the posttest BDI domain scores. However, it can be seen in Table 7.5 that there were no statistically significant differences between the groups on any of the BDI measures. In fact, except for the BDI cognitive domain score, the control group outperformed the treatment group on all mean BDI domain and total scores (adjusted and unadjusted).

Table 7.4

Comparability of Groups on Pretest Measures for the Belleville Project

Variable	Subjects Included in Posttest Analysis						p Value	ES[$]
	Control Group			Treatment Group				
	$\bar{x}$	SD	n	$\bar{x}$	SD	n		
• Age in months at pretest	14.9	5.8	9	16.3	9.2	11	.70	.24
• Battelle Developmental Inventory (BDI)[+]								
Personal Social	38.4	16.6	9	36.7	19.5	11	.84	-.10
Adaptive Behavior	29.3	10.3	9	30.5	17.4	11	.86	-.12
Motor	46.8	21.9	9	43.3	30.2	11	.78	-.16
Communication	21.1	10.3	9	21.5	11.6	11	.93	.04
Cognitive	17.7	6.4	9	17.0	9.3	11	.86	-.10
TOTAL	153.3	69.5	9	149.1	84.8	11	.90	-.07
• Parenting Stress Index (PSI)[#@]								
Child Related (range 47 to 235)	122.0	20.0	9	107.0	20.0	11	.11	.75
Other Related (range 54 to 270)	134.0	26.0	9	122.0	33.0	11	.42	.46
TOTAL (range 101 to 505)	256.0	44.0	9	230.0	49.0	11	.23	.59
• Family Adaptation and Cohesion Evaluation Scales (FACES)[*#]								
Adaptation (range 0 to 26)	6.3	3.3	9	3.8	3.3	11	.11	.76
Cohesion (range 0 to 30)	5.0	3.3	9	5.0	3.1	11	.96	0
TOTAL (range 0 to 40)	8.4	3.8	9	6.9	3.4	11	.37	.39
• Family Resource Scale (FRS)[&%]	51.0		9	48.0		11	.88	-.07
• Family Support Scale (FSS)[&%]	47.0		9	63.0		11	.59	.40
• Family Index of Life Events (FILE)[^#]	11.2	4.7	9	11.5	6.3	11	.90	-.06

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children)

[^] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[$] Effect sizes (ES) for continuous data were estimated as follows: $ES = \bar{X}_e - \bar{X}_c + S_c$. Positive ESs were for differences in favor of the intervention group when appropriate (e.g., household income).

Table 7.5

Posttest Measures of Child Functioning for the Control-Treatment Groups for Citizens for the Belleville Project

Variable	Covariates[§]	Control Group				Treatment Group				ANCOVA F	P Value	ES[^]
		$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n			
• Age in months at Posttest		25.9	6.4		9	27.3	10.1		11	.36	.73	.22
• **Battelle Developmental Inventory (BDI)**												
DQs for:												
Personal-Social	1	65.0	21.2	64.3	9	65.2	29.9	65.9	11	.09	.77	.08
Adaptive Behavior	1	45.0	10.7	44.6	9	45.2	20.6	45.6	11	.05	.82	.09
Motor	1	74.3	21.6	73.7	9	68.9	29.4	69.5	11	.45	.51	-.19
Communication	1	35.4	14.5	35.0	9	35.8	19.9	36.3	11	.17	.69	.09
Cognitive	1	26.0	9.9	25.7	9	25.8	12.2	26.1	11	.02	.88	.04
TOTAL	1	242.3	79.3	239.9	9	240.9	107.7	243.4	11	.04	.84	.04

[^] Effect Size (ES) is defined here as the difference between the groups (Treatment minus Control) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977; for a more general discussion of the concept of Effect Sizes).

[§] 1 = Battelle Raw Pretest Total Score

Conclusions

The purpose of this study was to evaluate whether a home-based early intervention program for children with handicaps from birth to 29 months would result in positive development changes as measured by a comprehensive developmental measure. Two counties in western Illinois where preschool services for the handicapped previously had not existed were targeted for this study. Eligible children were stratified by severity or type of handicap and age and randomly assigned to either a home-based intervention group or a no treatment control group. Subjects and their families were pretested to determine any pretreatment group differences, and the groups were found to be comparable. Treatment verification procedures were used to document that the early program was implemented in an appropriate manner. The intensity and duration of the intervention for the treatment group was comparable to what is delivered in typical practice and stood in contrast to the virtual lack of services received by the control subjects and their parents. There were no statistically significant between-group differences on any of the posttest BDI measures.

This study was not without its flaws. It would have been desirable to have had posttest family measures and additional child measures to assess more broadly any possible treatment effects. In addition, the period of treatment may have been too short to have had a measurable effect. However, the fact remains that randomly assigned subjects demonstrated no treatment effects following a significant period of intervention.

These results are consistent with the Sandow et al (1981) study and challenge the assumption that the more intensive the intervention, the greater will be the impact. What makes this study more compelling than the Sandow et al (1981) study is that subjects were randomly assigned to groups, the child assessments were developmental in nature and obtained by blind diagnosticians, and the treatment intervention was well documented. These results underscore the arguments made by White and Casto (1985) and their associates that we need to continue to empirically test many of the assumptions on which delivery of early intervention services are based. The best way to do this is often with randomized experimental studies in which the effects of alternative types of interventions are rigorously tested.

DES MOINES PUBLIC SCHOOLS

Project #12

COMPARISON: Mildly to Severely Handicapped Children -- Center-based intervention plus parent training vs. center-based intervention only

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DATE OF REPORT: 10-9-89

Rationale for the Study

Parent involvement is often considered an important part of early intervention programs for young children who are handicapped. This belief is so strong that it has been incorporated into the law mandating services for these young children, P.L. 99-457. Unfortunately, this belief is not supported empirically (White et al., 1989). Concerns have been raised regarding the efficacy of parent involvement in general and, specifically, to what types of parent involvement are most beneficial to children and families (Casto & Mastropieri, 1986; White et al., 1989). This study examined the effect of parent involvement, in the form of weekly parent meetings focused either on training parents to work with their children on skills/behaviors, on educating parents in various topics, and on parent support issues, when included as part of a center-based intervention program.

Review of Related Research

The issue of parent involvement in early intervention has been a subject of many reviews of literature (Bronfenbrenner, 1974; Comptroller General, 1979; Datta, 1971; Floren & Dokekci, 1983; Karnes, 1978; Lazar & Darlington, 1982). These reviews have almost unequivocally stated the necessity of involving parents in early intervention for their child. In examining the research studies cited by these reviews, White et al. (1989) found that the individual results did not support the conclusions of the reviews. White et al. raised further concerns by concluding that the research cited in these reviews had focused only on disadvantaged children, were of relatively poor methodological quality, and had defined parental involvement only as using the parent as a supplemental therapist.

White et al. (1989) raises two concerns that are relevant to this study. (1) What are the effects of parent involvement on young children with handicaps? (2) What is the most effective way to define and implement parent involvement programs for parents of children with handicaps?

White et al. provide some information regarding the first question. Using data that had been prepared for a meta-analysis of early intervention (Casto & Mastropieri, 1986), White et al. compared effect sizes from 89 studies that used children with handicaps. All these studies compared extensive/moderate parent involvement to little/no parent involvement. The results of this analysis were equivocal with respect to degree of parent involvement (i.e., more parent involvement was not necessarily better).

Studies (from the above analyses) investigating the effect of parental involvement in early intervention for children with handicaps were individually examined. Unfortunately, the majority of these were indirect comparison, confounded by differences in the interventions being compared. Only five studies were found, other than those being conducted by EIRI, that directly compared parent involvement with no parent involvement (Barnett, Escobar, & Ravsten, 1987; Henry, 1977; Miller, 1981; Minor, Minor, & Williams, 1983; Scherzer, 1976). Although all these studies report positive effects of parent involvement, their research methodology was lacking. In all these studies, parents were trained to provide some type of therapy.

In regard to the second question raised earlier, parent involvement has been defined by Peterson and Cooper (1989). They delineate six aspects of parent involvement programs: (1) information provision, (2) professional partnership, (3) support network, (4) training, (5) respite care, and (6) informal contact with staff. Although these aspects may overlap, studies primarily focus on a single aspect. Gatling and White (1987), in a review of 172 parent involvement studies, found that over 80% of studies focus on parent training (i.e., training parents to act as an intervenor or therapist for their children) as either the sole or major focus of the parent involvement program.

Another issue that has been overlooked in the majority of research on parent involvement are issues related to changes that may occur in the family. If using an ecological model (Bronfenbrenner, 1979; Dunst, 1986), parent involvement activities may affect aspects of family functioning that may impact on the child's later development and functioning (see Blacker, 1984; Kaiser & Fox, 1986), even though immediate child effects may not occur. For example, families of handicapped children are likely to be highly stressed (Gallagher, Beckman, & Cross, 1983) and in possible need of assistance to continue functioning as a "normal" family unit. Parent involvement activities may reduce this stress. Unfortunately, research on the efficacy of parent training interventions have not included the assessment of possible impact on family functioning.

It is clear that there are a variety of efficacy issues surrounding parent involvement that require examination. Problems in the parent involvement literature includes equivocal effects from studies examining different levels of parent involvement on child developmental progress. Unconfounded studies that have occurred are few in number, and methodological problems make their results suspect. Parent involvement has not been clearly defined across studies; although training the parent to act as an intervenor/therapist for their child is the most common intervention. Studies have failed to examine family functioning variables. The present study was designed to address these concerns.

Overview of Study

The primary curriculum for the parent attended meetings (Parents Involved in Education [PIE]; Pezzino & Lauritzen, 1986) was structured to include that component that had been used most frequently in past research (i.e., training parents as an intervenor/therapist for their child). Providing parents with information and parent support issues were also included in the PIE, but the primary focus was on teaching parents to provide supplemental therapy to their handicapped children. Interventions similar to the PIE are commonly offered as an addition to an established early intervention program (Gatling & White, 1987). The present study approached the question of parent involvement by comparing the PIE as a supplement to a center-based intervention program versus the effects of the center-based program without the PIE. This study assessed the impact of these interventions on both child progress and family functioning across the time the intervention was in effect, and longitudinally assessed.

In addition, this study investigated the issue of whether parent attended meeting with a training (PIE I) or support-oriented (PIE III) focus were more efficacious (cf., White et al., 1989). Parent support as an appropriate focus for parent intervention activities is receiving attention and interest in recent literature (e.g., Dunst, 1986; Hanline & Knowlton, 1988; Zeitlin & Williamson, 1988). Little information regarding the optimal way to provide parent support intervention exists for preschool-aged children with handicaps, and no comparative information exists on the effect of a parent support intervention on children and families. To provide some preliminary information, parents who participated in PIE and whose children remained in the early intervention program for a second year participated in an intervention focused on parent support (PIE II; Durbala & Hollinger, 1988). Results from parents and children involved in PIE II will allow comparisons to be made between those receiving intervention only with PIE and those receiving center-based intervention only, as well as intra-subject comparisons of those receiving both PIE and PIE II.

Methods

Subjects participating in this study were served through the Des Moines Public School System. The Des Moines public schools serve all children who are handicapped in the Des Moines School District from birth through 6 years of age. (The State of Iowa has had a law mandating a free and appropriate public education to children birth through 5 since 1975.) Children with handicaps in the Des Moines Public Schools ages 0-2 are typically served through home-based intervention programs, while handicapped preschoolers ages 3-6 typically receive intervention services in center-based settings. The general philosophy of the Des Moines Public Schools is to provide high-quality educational services that maximize each child's individual potential. Programs are developed based on comprehensive individual assessments conducted by members of a multidisciplinary team. Parents are required to participate in the development of Individualized Education Plans and are strongly encouraged to become involved with the educational process.

Subjects participating in this study were served at the Phillips, Findley, and Perkins schools. This represents three of many schools in the Des Moines Public School System in which handicapped preschoolers are served. These specific schools were selected because teachers and professional support staff (psychologists, speech therapists, occupational therapists, social workers) who work in these schools volunteered to conduct this research study in collaboration with EIRI. The liaison at the Des Moines site who is responsible for coordinating the day-to-day activities of the research study is a school psychologist employed by the school district who has responsibilities at each of the three participating locations.

Subjects. The subjects that have been enrolled in this project can be divided into two distinct cohorts (see Table 12.1). The first cohort is those subjects who were enrolled during the 1986/87 academic year. There were 56 subjects in this cohort (30 control, 26 experimental), 40 of whom were male. The subjects ranged in age from 35 to 72 months at the time they became involved in the research.

The second cohort consists of those subjects newly enrolled during the 1987/88 academic year. There were 20 subjects in this cohort (12 control, 8 experimental), 15 of whom were male. The age of subjects in this cohort ranged from 36 to 72 months when intervention began.

A subgroup of the first cohort consists of those subjects who participated in the research for 2 years. This subgroup consisted of 34 subjects (15 control, 19 experimental), 22 of whom were male. These subjects ranged in age from 35 to 61 months when their participation began.

For this report, the analyses will examine subjects who received a first and second posttest. Post #1 included all subjects from the 1986/87 and subjects newly enrolled from the 1987/88 academic years (see Table 12.1). All subjects in this group received one year of intervention. This group was comprised of 76 subjects (42 control, 34 experimental), 55 of whom were male. These subjects ranged in age from 35 to 72 months at the time they began participation in the research. Approximately 75% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive and language impairments. The degree of handicap for all subjects ranged from severe to mild. The majority of subjects

Table 12.1

Group Assignment Information and Posttesting Schedule by Academic Year for the Des Moines Study

Intervention	n	Fall 86	Spring 87	Fall 87	Spring 88	Fall 88	Spring 89
Only PIE I (Yr. 1)	7	Pre[*]	Post 1[*]		Post 2		Post 3
Pie I and II	19	Pre	Post 1		Post 2		Post 3
Only PIE I (Yr. 2)	8			Pre	Post 1		Post 2
No PIE I (Yr. 1)	15	Pre	Post 1		Post 2		Post 3
No PIE I or II	15	Pre	Post 1		Post 2		Post 3
No PIE I (Yr. 2)	12			Pre	Post 1		Post 2

[*] Pre = Pretest

[*] Post(#) = Posttest (number indicating which posttest)

were mild to moderately delayed, 55% had developmental quotients (based on the BDI Total score) below 65.

The Posttest #2 data from these subjects will also be presented. Subjects who continued in the early intervention program and subjects who "graduated" to school-age programs are included in these analyses. Subjects who continued in the program are those who were referred to earlier as the subgroup of the first cohort.

Data from this subgroup of the first cohort will also be discussed as a separate analysis. The degree of handicap for these subjects varied, and 60% had developmental quotients (based on the BDI Total Score) below 65. Approximately 70% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive impairments.

Recruitment. Parents of children in participating schools who were scheduled for preschool placement at the beginning of the academic year were considered for inclusion in the study if the following criteria were met: (a) One parent was not working or the parent could guarantee time off from work. This was done to help ensure parents had time available to attend parent meetings. (b) The child was not profoundly retarded. Preschool program staff were of the opinion that the needs of parents of these children would not be best met through the PIE. Parents of children at the participating schools who met these criteria were individually approached by preschool program staff. Preschool staff described the research and detailed parent and staff requirements. Placement in study group by random assignment procedures was described. If interested, parents returned an informed consent letter that clarified their requirements for participation, research staff obligations, and stated that assignment to groups would be randomly determined. Approximately 95% of the parents who were approached regarding the research agreed to participate.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups prior to the initiation of treatment, either to a group in which parents received the PIE (Center + PIE) or to a group in which parents received no additional involvement other than what was provided to all parents through the center-based program (Center Only). Both groups continued to receive the same level of center-based services that were previously available through the school's program for preschoolers with handicaps.

In order to ensure the comparability of groups, subjects were randomly assigned to groups after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (35-42 months, 43-54 months, and over 55 months) and level of parent motivation (either "high" or "low") as perceived by each child's teacher. Categorizing subjects in this way resulted in subjects falling into one of six mutually exclusive categories. Within each of the six categories, subjects were rank ordered from low to high based on their CAPER scores (the CAPER, a test of developmental functioning, was administered by school personnel at an earlier date).

After subjects were categorized, they were then alternately assigned to one of the two conditions. Group determination of the first-listed subject (the subject with the lowest CAPER score) in each age by motivation category was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups. Subjects that participated for 2 years remained in the originally assigned group.

Demographic characteristics. The subject pool for this study is complete, and no new subject recruitment will occur. Future efforts will focus on the collection of follow-up data. Seventy-six subjects received one year of intervention. Subjects for this study represented a fairly homogenous sample (see Table 12.2). The majority of subjects were Caucasian males with one sibling. The parents of the subjects were in their late 20s or early 30s and had a high school education. The majority of subjects' families were intact, in that both parents lived at home, and traditional, in the sense that the mother was the primary caregiver. English was the primary language for all families. Family income placed the families as lower to middle class.

Table 12.2 presents data for subjects who received one year of intervention by group on demographic characteristics. Some discrepancies between the Center-Only and Center + PIE groups are indicated. Mothers of subjects in the Center + PIE group tended to be older than mothers of subjects in the Center-Only group, and they also had higher levels of education. Fathers of Center + PIE subjects were much more likely to hold occupations placing them in higher SES categories. In addition, household income for families of subjects in the Center + PIE group tended to be higher than that for Center-Only subjects' families. These discrepancies in demographic characteristics favor the Center + PIE group. Thus, there appears to be an initial bias in favor of the Center + PIE group. Variables where discrepancies occur will be considered as covariates in later analyses, as appropriate.

On measures that present demographic information on fathers, data are presented from a smaller "n" than many other variables. This can be partly attributed to data collection methods. Mothers were the primary providers of demographic and family functioning measures. In the majority of cases where "father data" was not obtained, it was not obtained from families where the father was not living at home.

Attrition. Of 86 subjects who received some intervention, 10 dropped from the study; all were experimental subjects. For control subjects, attrition was defined as the child withdrawing from intervention after having received a minimum of three months of intervention. All experimental group attrition was related to parent inability to attend parent training meetings and their expressed desire to be removed from the study. As a result of this attrition, 76 subjects completed one year of intervention.

Attrition for the PIE group was defined as the parent indicating that he/she was not interested in continued participation in the research project or withdrawal

Table 12.2
Comparability of Groups on Demographic Characteristics for Des Moines Parent Study

	One Year of Intervention							
	Center Only			Center + PIE			p Value	ES[$]
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
• Age of child in months at pretest	53.0	(11.7)	42	52.3	(11.9)	34	.82	-.06
• Age of mother in years at pretest+	28.2	(5.6)	40	30.8	(4.8)	33	.03	.46
• Age of father in years at pretest+	30.3	(6.8)	33	33.1	(6.1)	27	.12	.41
• Percent Male*+	71.4		42	73.5		34	.84	.05
• Years of Education for Mother	11.4	(2.2)	42	12.7	(1.9)	34	.01	.59
• Years of Education for Father	11.8	(2.2)	32	12.8	(2.6)	31	.13	.45
• Percent with both parents living at home *	66.7		42	70.6		34	.72	.08
• Percent of children who are caucasian*	80.5		41	91.2		34	.19	.31
• Hours per week mother employed+	6.6	(12.0)	41	5.4	(11.0)	34	.69	.10
• Hours per week father employed+	32.1	(22.6)	27	33.3	(22.3)	29	.84	.05
• Percent of mothers employed as technical managerial or above*	5.0		40	2.9		34	.66	-.10
• Percent of fathers employed as technical managerial or above*	10.3		29	37.9		29	.01	.67
• Total household income	$14,307	(15,496)	39	$21,632	(18,323)	34	.07	.47
• Percent with mother as primary caregiver*	95.0		40	97.1		34	.66	.10
• Percent of children in day care*+	35.9		39	35.3		34	.96	.01
• Number of siblings +	1.3	(0.8)	41	1.45	(0.8)	34	.42	.19
• Percent with English as primary language*	100		41	100		34	1.0	.00

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "0"

[+] Absolute ES values are presented.

[$] $$ES = \frac{\overline{X}\text{ (Center + PIE)} - \overline{X}\text{ (Center only)}}{\text{SD (Center only)}}$$

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for any reason after PIE sessions had begun. This differs from the case where the parent attended PIE meetings infrequently, but did not express a desire to be removed from the study.

No attrition has occurred with those subjects enrolled in intervention for two consecutive years. Of those subjects who "graduated" into the school-age program, seven were lost to attrition during the 1988 testing. Five were center-only subjects, and two were Center + PIE subjects. In the Center-only group, one family chose to discontinue participation, one family had moved, one child had recently been institutionalized and permission to test was not obtained, and the parents of two children refused testing at that time. In the Center + PIE group, one child was in a foster placement and unavailable for testing, and the parent of the other child refused testing at that time. It should be noted that during the 1989 testing, the three subjects whose parents refused testing in 1988 have been tested. The family that moved has returned to Des Moines and efforts to contact and test are being made. Obtaining permission to test the institutionalized child is being explored.

The 1989 follow-up testing of children is completed with minor exceptions. At this time, 69 of the 76 children who received one year of intervention have been located and tested. The probability of testing four more children is very high. This would leave only three children lost to attrition (two center-only). For these three children, parents have withdrawn their child from the study and strongly indicated their desire to not continue.

Attrition analysis. To examine the effect of subject attrition on the pool of subjects, attrition analyses on demographic and pretest variables were conducted on the 10 subjects who dropped during the first year of intervention. Where all attrition occurred in the Center + PIE group, the attrition analysis compared these subjects only with those that remained in the Center + PIE group. These data are presented in Table 12.3 and 12.4.

Table 12.3

Attrition Analysis on Demographic Characteristics of Subject Who Remained or Dropped from the Study and from the Parent Training Group for Des Moines Parent Training Study

	All Parent Training Group Subject							All Subjects						
	Remained			Dropped				Remained			Dropped			
Variable	X̅	(SD)	n	X̅	(SD)	n	P Value	X̅	(SD)	n	X̅	(SD)	n	P Value
• Age of child in months at pretest	52.3	(11.9)	34	48.5	(11.9)	11	.36	52.7	(11.8)	76	49.2	(12.6)	13	.33
• Age of mother in years at pretest	30.8	(4.7)	33	28.4	(4.8)	10	.17	29.4	(5.4)	73	28.5	(5.6)	12	.59
• Age of father in years at pretest	33.1	(6.1)	27	33.9	(6.3)	8	.75	31.6	(6.6)	60	32.8	(6.6)	9	.59
• Percent Male *	73.5		34	75.0		12	.92	72.4		76	82.4		17	.40
• Years of Education for Mother	12.6	(1.9)	34	12.0	(1.6)	12	.31	12.0	(2.2)	76	1[illegible].9	(1.6)	17	.95
• Years of Education for Father	12.8	(2.6)	31	12.2	(3.3)	9	.60	12.3	(2.5)	62	12.3	(2.5)	15	.96
• Percent with both parents living at home *	70.6		34	53.9		13	.29	68.4		76	61.1		18	.56
• Percent of children who are caucasian *	89.3		28	85.7		7	.80	85.3		75	72.2		18	.19
• Hours per week mother employed	5.1	(11.0)	34	7.3	(13.8)	12	.58	6.0	(11.6)	75	5.8	(13.0)	17	.95
• Hours per week father employed	33.3	(22.3)	29	30.0	(24.5)	6	.75	32.7	(22.2)	56	36.2	(21.6)	10	.65
• Percent of mothers employed as technical managerial or above *	2.9		34	0.0		13	---	4.1		74	0.0		18	---
• Percent of fathers employed as technical managerial or above *	37.9		29	28.6		7	.66	24.1		58	27.3		11	.83
• Total household income	$21,632	(18,323)	34	$23,916	(26,811)	6	.79	$17,719	(17,151)	73	$23,916	(26,811)	6	.60
• Percent with mother as primary caregiver *	97.1		34	100.0		12	---	96.0		74	100		17	---
• Percent of children in day care more than 5 hours per week *	2.9		34	0.0		12	---	4.1		73	0.0		17	---
• Number of siblings	1.5	(0.8)	34	1.5	(1.5)	13	.88	1.4	(0.8)	75	1.3	(1.4)	18	.91
• Percent with English as primary language *	100.0		34	100.0		13	1.0	100.0		75	100.0		18	1.0

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Table 12.4
Attrition Analysis on Pretest Measures of Subjects Who Remained or Dropped from the Study and from the Parent Training Group for Des Moines Parent Training Study

	All Parent Training Group Subjects							**All Subjects**						
	Remained			Dropped				Remained			Dropped			
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value
• Battelle Developmental Inventory (BDI) * DQs for:														
Personal Social	67.5	(18.5)	34	63.1	(12.2)	11	.31	68.5	(19.9)	76	62.4	(11.6)	13	.20
Adaptive Behavior	63.1	(22.1)	34	70.0	(14.3)	11	.61	67.3	(19.6)	76	68.5	(13.7)	13	.74
Motor	62.7	(27.8)	34	66.5	(17.4)	11	.61	67.4	(20.5)	76	71.7	(16.6)	13	.97
Communication	57.5	(20.6)	34	59.2	(20.0)	11	.81	58.8	(18.3)	76	63.0	(18.6)	13	.81
Cognitive	64.0	(19.6)	34	67.5	(19.6)	11	.73	64.3	(18.2)	76	70.5	(19.6)	13	.68
TOTAL	62.6	(16.7)	34	64.7	(12.5)	11	.84	64.6	(15.3)	76	66.1	(11.8)	13	.78
• Parenting Stress Index (PSI) Δ														
Child Related (range 30 to 250)	117.4	(18.4)	34	121.0	(24.5)	13	.58	118.3	(19.4)	75	118.0	(23.7)	17	.96
Other Related (range 54 to 270)	131.6	(28.8)	34	122.8	(22.8)	13	.33	131.5	(25.9)	75	125.8	(21.5)	17	.40
TOTAL (range 101 to 505)	248.9	(43.3)	34	243.8	(44.2)	13	.72	249.9	(41.2)	75	243.8	(40.3)	17	.59
• Family Adaptation and Cohesion Evaluation Scales (FACES) †														
Adaptation (range 0 to 30)	3.6	(2.3)	34	4.0	(2.9)	13	.62	5.0	(3.3)	75	4.6	(3.2)	18	.65
Cohesion (range 0 to 26)	4.0	(3.5)	34	3.3	(1.9)	13	.43	4.8	(4.4)	75	3.7	(2.9)	18	.18
TOTAL (range 1 to 40)	5.9	(3.3)	34	5.6	(2.7)	13	.80	7.6	(4.6)	75	6.4	(3.6)	18	.31
• Family Resource Scale (FRS) ∞ (range 30 to 150)	116.3	(19.5)	34	118.4	(17.8)	13	.73	117.8	(16.9)	75	118.8	(18.7)	18	.83
• Family Inventory of Life Events (FILE)Δ (range 0 to 71	12.0	(8.0)	34	9.6	(6.9)	13	.36	9.6	(6.7)	75	10.1	(6.3)	18	.81
• Family Support Scale (FSS) Total Score ΔΔ (range 0 to 4)	2.2	(0.8)	33	1.7	(0.4)	13	.03	2.0	(0.7)	73	1.8	(0.7)	18	.31

NOTES: * Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

∞ Analyses for the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

Δ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

ΔΔ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

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The only significant difference was found on pretest scores from the Family Support Scale (FSS). Parents who dropped from the training group reported less support as measured by the FSS. These analyses indicate that attrition was not related to a specific subgroup of the sample, except, perhaps, in the area of family support.

Intervention Programs

The Des Moines Public School System provided educational services to preschool-aged children, ages 3 through 6, who exhibited developmental delays or who were handicapped. These children received center-based, half-day, 5-day-per-week intervention services. Children received services in educational formats (i.e., large group, small group, and one-to-one) according to their individual needs from special education teachers and teacher associates (paraprofessionals). Language and motor therapists assessed children, provided teachers with objectives, helped teachers integrate instructional therapeutic activities into on-going routines, and provided individualized services as needed. Teachers were free to use various curricula or to develop their own objectives when developing intervention goals and strategies.

The Des Moines Public School Early Intervention Program provided services to a wide variety of children who were handicapped, from those exhibiting mild delays to those exhibiting more severe handicaps. The majority of children served were Caucasian, and a wide variety of SES levels were represented. As part of these services to children, parents were regularly involved in IEP meetings, and teachers attempted to include and keep parents informed of classroom activities as child and parent needs dictated. In practice, this resulted in regular parent contacts regarding child progress and participation at IEP meetings, but nothing else.

The purpose of the research study occurring with the Des Moines Public School Early Intervention Program was to compare the effects of their current service delivery system with the same system enhanced by the inclusion of systematic parent involvement efforts. In both the control and experimental conditions, children received services in the center-based Des Moines Public School Early Intervention Preschool Program. No changes were made to this system for the purposes of the study. Children in the basic and parent involvement interventions were not segregated by classroom or teacher in the center-based service. In the experimental group, parents of children enrolled in the early intervention program were exposed to a systematic parent curriculum. In their first year of involvement, parents were involved in the Parents Involved in Education (PIE I) package (Pezzino & Lauritzen, 1986). Parents whose children remained in the program for a second year and were in the experimental group were involved in the Parents Involved in Education II (PIE II) package (Durbala & Hollinger, 1988). Data on group assignment were presented earlier in Table 12.1.

Center-Only intervention. Children assigned to this group attended an existing center-based, half-day, 5-day-per-week intervention program in which they received small group and individualized teaching sessions from special education teachers and paraprofessional aides. All teachers were certified and were responsible for supervision of their respective aides. None of the aides were certified as teachers. The training for aides consisted mostly of periodic inservices provided by the school district that both teacher, aides, and support staff attend, and on-the-job training provided by their respective teachers and the collaborating speech and motor therapists. Each class of approximately 10 children had one special education teacher and one aide. Because each child's program was "IEP driven," motor and speech therapists' contact with children varied widely. In general, a motor and speech therapist was present in each class for the equivalent of 1-day-per-week. During a typical day, children were instructed in the motor, speech and language, self-help, cognitive, and social skills areas. As part of the regular services to children, parents were involved in IEP meetings, and teachers provided parents with IEP updates. These updates generally consisted of progress notes and meetings with parents that included suggestions for home activities.

The CAPER, along with other curriculum-linked assessment tools were used in determining intervention goals and strategies. Intervention activities were developed from comprehensive assessments and items drawn from a number of curricula. Teachers were free to select curriculum based on child need. The skill sequences in the curricula used extended beyond the child's current level of functioning, and functional skill training routines were included in the curricula to the degree appropriate.

Center + PIE intervention. In addition to the center-based service described above, parents of children in this group were offered parent meetings structured by the PIE curricula. PIE I training modules were taught by the preschool professional staff and were designed to provide parents with a systematic, conceptual, and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small-group lecture, discussion, and demonstrations. The average small group size was between 8 and 12 parents. PIE sessions consisted of 16, 2-hour meetings presented roughly one per week. PIE sessions also included a social support component in which parents had the opportunity to share feelings and express problems, challenges, and other issues associated with their lives. Parents were primarily responsible for determining the agenda for the social support component of the session. This occupied the last 15 minutes of the session and focused on issues such as problems with relatives, finding day care, etc. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention.

Parents whose children remained in the preschool program for a second year continued in a systematic, parent intervention, but through a different intervention package. The children continued in appropriate center-based services. Parents attended meetings structured by the *Parents Involved in Education II (PIE II)* curriculum (Durbala & Hollinger, 1988). The PIE II was developed based on a parent needs assessment and focused on parent support issues. Issues addressed included: dealing with parent stress, developing parent communication skills, teaching problem-solving skills, and providing information on areas of interest. The training format for PIE II was the same as PIE I, except 12 sessions were held. Parent home activities that were presented focused on support (e.g., practice parent-focused stress reduction technique, find out relevant information) rather than child training issues. As in PIE I, a social support component was available at the end of each session.

PIE I and PIE II were conducted by preschool program support staff (e.g., school psychologist, speech and language therapists, consultant, nurse). Classroom teachers and aides were not involved in the PIE meetings and were only indirectly aware of the goals of PIE. Each PIE group was facilitated by a team of two staff members. All parent facilitators received instruction in PIE I and PIE II by their respective developers prior to its initial implementation. Meetings were primarily attended by the children's mothers. Table 12.5 lists the session topics for PIE I and PIE II.

The intent of the PIE I sessions was primarily to give parents knowledge of and to teach skills that would enable them to serve as interventionists in the home setting. PIE I was based on the philosophy that child progress can be maximized by

Table 12.5

Content of PIE I and PIE II

Session	Topic
PIE I	
1.	Introduction and overview
2.	Objective observation of child behavior
3.	Defining and measuring behavior
4.	Principles of behavior management
5.	Analyzing behavior chains
6.	Theories of child development
7.	Testing and assessment
8.	Criterion-referenced assessment
9.	Developing learning objectives
10.	P.L. 99-142 and IEPs
11.	Intervention strategies
12.	Factors related to teaching success
13.	Practice teaching session
14.	Determining appropriate interventions
15.	Communicating with professionals
16.	Review, comments, concerns, questions
PIE II	
1.	Parent needs assessment and introduction
2.	Child development and behavior management
3.	Stress reduction
4.	Strategies for improving social and language skills
5.	Strategies for improving self-help and cognitive skills
6.	Communication
7.	The grief process
8.	Community services
9.	Feelings of siblings and extended family members
10.	Understanding my child's rights: Dialogues with professionals
11.	Promoting family fun
12.	Review, questions, and evaluation

training parents as interventionists and that the skills parents learn (i.e., their success as an interventionist) will allow the family to more competently function (i.e., by reducing parent stress and uncertainty). In contrast, although the primary intent of PIE II was also to provide knowledge, the knowledge dealt more with information on the effect of a child with a handicap on the family, and strategies to normalize the functioning of the family. The philosophy behind this approach ties into the ecological model of development (Bronfenbrenner, 1979), in that positive changes in the family are expected to have positive effects on each individual family member. In addition to the PIE, parents in the Center + PIE group were provided the opportunity to attend four sessions conducted by the school nurse. These sessions focused on involvement of both spouses, where possible, and on facilitating communication between families. These sessions were informal in nature and focused on a topic such as a discussion on child nutrition, and on activities (e.g., a family swim night, making gifts at Christmas time).

Treatment Verification

A number of procedures have been implemented in order to provide an independent verification of the specifics of the intervention program. Treatment verification data are presented in Table 12.6 for subjects receiving one year of intervention. Child attendance data for basic services and parent attendance data for PIE meetings were recorded throughout the year. Child attendance was recorded daily, and parent attendance data (for the Center + PIE group) was recorded weekly; these data were sent to EIRI on a monthly basis.

Initial analysis of attendance data indicates no difference in child attendance rates as a function of group placement (Table 12.6). Average attendance for all subjects was 88.2% of possible school days. Average attendance by parents at the PIE meetings sessions was 47.6% of all meetings. Fifty-seven percent of parents attended between 5 and 11 meetings; only 13% of parents (5 parents) attended more than 75% of the time. These absences occurred in spite of repeated attempts by program staff to encourage regular attendance. The local site coordinator regularly called absent parents to promote attendance. These data pertain only to PIE I and will need to be considered when conducting data analysis and discussing results.

Table 12.6

Treatment Verification Data for Subjects Receiving One Year of Intervention for Des Moines Study

	Center-Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
• General health of child[&]	2.0	(0.5)	39	1.9	(0.7)	32	.66	-.20
• Percent child attendance	87.3	(7.9)	38	90.0	(6.6)	34	.13	.34
• Parent satisfaction[^]	24.9	(2.5)	29	25.1	(2.9)	26	.73	.08
• Teacher rating of parents[#]	5.3	(2.0)	40	7.0	(1.9)	34	.001	.85
• Parent PIE attendance	—	—	—	47.6	(22.0)	34	—	—
• Test of Parent Knowledge[+]	10	(4.0)	41	15	(6.0)	34	.00	1.25
• Percent receiving speech therapy[*]	7.3		41	9.1		33	.79	.06
• Percent receiving motor therapy[*]	7.3		41	6.1		33	.83	-.05
• Percent receiving daycare[*]	19.5		41	24.2		33	.63	.11

NOTES:

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[^] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] These results are based on an analysis of covariance. Covariates include: BDI Adaptive Score, FACES Total, Motor PPVT Score, and Family Income. Adjusted means are presented.

[+] Data are presented in minutes/week and are based on parent report of time spent at home on instructional activities. See text for more detail.

A description of quality of parent involvement was also gathered annually by a direct intervenor (teacher) who worked most closely with the respective parent. The data obtained was the intervenor's perception (low, average, high) of how a parent rated on attendance, knowledge, and support. These data are presented in Table 12.6. Teachers rated parents in the Center + PIE group as having a higher quality involvement with the school program. This occurred although teachers were not directly informed of child group placement (although information could have been shared by parent and teacher or indicated through other cues).

In addition to the intervenor's rating of parents, parents were asked to rate their satisfaction with the program (see Table 12.6). Parents rated the intervention program on seven questions that assess satisfaction in a variety of areas (e.g., staff, participation, communication, etc.). Parents in both groups were equally satisfied with the center-based program. Satisfaction data were not obtained from parents who began intervention in 1987-88 (20 parents).

Health data on each child was also obtained as an additional verification measure. Data on hospitalizations (and length), days with fever, a general health rating of the child, and other factors were collected. Data on child general health are presented in Table 12.6. No differences between the study groups were found on any of the health measures.

Teachers in the Des Moines district were also evaluated annually by their immediate supervisor. These data are relevant to treatment verification. Teachers were rated by their supervisor either as being satisfactory or as needing training. The Des Moines School District uses only two rating levels as per an agreement with the local teachers' union, and no other evaluations can be conducted as per the contract. All teachers of subjects involved in this study received a satisfactory rating.

Additionally, information was obtained at posttest on the amount of time each child spends in various activities/therapies (such as day care, speech therapy, etc.) that occur outside of the center-based intervention during the academic year. The data for the three most frequently occurring additional services, excluding religious activities, are presented in Table 12.6. No group differences were found.

Site review. A final major source of treatment verification information was a site review conducted annually by the site coordinator. The first site review was conducted on April 10, 1987, and a second site review was conducted on May 10 and 11, 1988. The purposes of these reviews were to: (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI were being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance.

Purposes (a) and (b) are of primary interest in this report. The Des Moines School District was conducting the research as intended by EIRI. Overall findings indicated: The preschool program was of high quality. It was staffed by enthusiastic and qualified professionals. Classroom environments were safe and appropriate. Teachers emphasized functional skills in naturally occurring environments. The program was competently administered, utilized up-to-date curricula, and had proper evaluation, assessment, and progress procedures. Parent training sessions were well organized and well facilitated, and parent participation was good. (For more information, a copy of the site reviews can be obtained.)

Cost of Alternative Interventions

The cost of the basic center-based program and the center-based + PIE I and PIE II programs, as described above, was determined using the ingredients approach. Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, and contributed resources. The cost of the center-based plus PIE I and center-based Plus PIE II is simply equal to the cost of the basic center-based program available to 210 children plus the additional cost of PIE I (provided to 8 families) or PIE II (provided to 14 families) in 1987-88. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 12.7 presents the cost per child in each of these resource categories.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Because

Table 12.7

Cost Per Child for Des Moines Study

Resource	Center-Based Only (N = 210)	Center-Based + P.I.E. PIE I (N = 8)	Center-Based + P.I.E. PIE II (N = 14)	Average PIE
Agency Resources:				
Personnel Direct Service	$3,855	$5,260	$4,391	$4,826
Administrative	1,401	1,401	1,401	1,401
Facilities	205	205	205	205
Equipment	30	30	30	30
Materials/Supplies	37	79	52	66
Transportation	490	490	490	490
Subtotal	$6,018	$7,465	$6,569	$7,018
Contributed Resources:				
Parent Transportation	0	83	49	66
Parent Time	0	706	639	672
Total	***$6,018***	***$8,254***	***$7,257***	***$7,756***

the program is operated within a public school system, school, and general direct administration were included. Occupancy charges included the annual rent for the facility in which the program was housed, all utilities, insurance, and maintenance costs. Equipment costs were based on estimates of the market replacement value of all classroom and office equipment, annualized to account for interest and depreciation. Staff transportation costs for job-related travel were based on actual mileage at $.21 per mile. The average cost per child for children in special education in the school district was used for child transportation costs. The cost for materials and supplies included the annual expense to the program for all consumable items.

Contributed resources included the value of parent time working at home with their children, attending training sessions, and the time and expense of driving to the sessions. Parents in the PIE I group spent an average of 16.5 hours and PIE II parents spent an average of 9.32 hours in training sessions, and, assuming that parents followed PIE curriculum requirements, 60 hours working at home with their child. In addition, parents in both groups were interviewed via telephone to determine their transportation expenses to attend sessions. Tie costs were assigned the opportunity cost of $9 per hour; mileage was assessed at $.21 per mile.

Thus, the basic center-based program cost $6,018. The addition of PIE I added $2,236, while PIE II added $1,239 to the basic program cost, including the estimated value of contributed resources.

Data Collection

It is important to note that the data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. A pretest-posttest group comparison format was used in this study.

The following procedures were completed at pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. In the first of two pretesting sessions, parents (usually the mother) completed the following family measures: the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES). In a second pretesting session, which took place within 2 weeks of the first session, children were administered the Battelle Developmental Inventory (BDI). Parents were paid $20 after both pretesting sessions were completed. These measures are considered core measures and are used at each of the EIRI research sites.

At posttest, a similar course of events occurred. The core battery, described above, was administered in two sessions. Additional tests and surveys were also administered (complementary measures); these varied slightly from the 1986/87 to 1987/88 academic year. These additional measures were individually selected for this site to allow possible site specific differences to be more clearly elucidated. Parents were paid $40 for completing the posttest battery.

Additional surveys completed both years by mothers included the CES-D Depression Scale, a Child Improvement (Locus of Control) Questionnaire, a parent satisfaction questionnaire, and treatment verification questionnaires at their first posttest session. Also, all mothers were administered a Peabody Picture Vocabulary Test (PPVT). At posttesting of the 1987/88 year, mothers also completed the Parents as a Teacher Scale and the Comprehensive Evaluation of Family Functioning. Mothers in the Center + PIE group also completed a satisfaction questionnaire specific to parent training.

During the 1986-87 year, children were administered the Stanford-Binet Test of Intelligence (Form L-M) as an additional measure. After some analyses of data obtained from this test and consideration of costs to administer, this measure was dropped. As an additional measure for children, the Joseph Preschool and Primary Self-Concept Inventory was added in 1987-88.

Recruitment, training, and monitoring of diagnosticians. The Battelle examiners were doctoral candidates in the School Psychology program at Iowa State University and professionals in the community (i.e., speech and language therapists) not currently working full-time. Their training included an extensive inservice on BDI administration and scoring, and each examiner, after administering a minimum of three practice BDIs, was required to pass a quality control test administration before they were permitted to test. Further, each examiner was "shadow scored" at least once during each testing period. Interrater reliability data reveal coefficients consistently above .90. All test protocols were also rescored by EIRI clerical staff and errors indicated. This rescoring has resulted in only minor errors being discovered, increasing confidence in the examiners. These examiners also administered the PPVT to mothers. This was done concurrent with the posttest BDI administration. None of the examiners had any involvement with the Des Moines School District program, so the likelihood of their knowing to which group a child was assigned was remote.

All Stanford-Binets were administered by three trained doctoral candidates in the Psychology program at Utah State University. All Stanford-Binet examiners were uninformed about the subjects' group assignments. None of the Stanford-Binet examiners had any other involvement with EIRI or the Des Moines Public Schools, so the likelihood of their knowing group assignments was also remote. During the 1987-88 year, the Joseph Self-Concept Inventory was administered by two of the Battelle examiners. Both the Stanford-Binet and the Joseph were administered while the child was in his preschool classroom placement. All family survey measures were administered to the parents in groups by the Des Moines site liaison. Parents were not allowed to discuss their surveys prior to or during these sessions. This method of administration was selected to help ensure that examiners remained "blind" to subject group placement.

Pretesting. Pretest data were collected at the beginning of the academic year. The specific measures administered and procedures for administration have been detailed above.

First posttesting. The first posttesting is that posttest that occurs after the child has been involved in the study for one academic year. Posttesting occurred at the end of the academic year and consisted of the core and complementary measures described above. As noted above, complementary measures varied slightly depending on the academic year the child was involved.

Second posttesting. The second posttest can be broken down into two groups; those children that remained in the preschool program for a second year and those children who moved into the Des Moines School District's school-age program. Each group will be discussed separately.

For those children that remained in the preschool program for a second year, the second posttest was similar to the first. The same package of core and complimentary measures described for the 1987/88 year was administered following the same procedures. Mothers were not re-administered the PPVT. Parents were paid $40 for their participation.

For children that moved into a school-age program, slightly different procedures have been followed (follow-up procedures). Appointments were made with parents for them to bring their children in for testing during the summer. The test battery for the summer included the core and complementary measures for the 1987/88 year. Parents did not complete the Comprehensive Evaluation of Family Functioning or the parent satisfaction questionnaire, and PPVTs were not administered. Parents did complete a child information form and provided research staff with permission to talk with the child's teacher. Parents were paid $40 for their participation.

On those children who "graduated" to school-age programs, their teachers were contacted and completed a Vineland Adaptive Behavior Scale and an information form. Teachers were paid $10 for their participation. Ninety-two percent of teacher-completed information was returned, although teacher opinion toward completing the Vineland was not favorable.

Third posttesting. The third posttest was completed in July, 1989. This posttesting included children who were one year and two years from intervention. Tests administered included the BDI, PSI, FACES, FRS, Parent as a Teacher Scale, CES-

D Depression Scale, the Child Improvement (Locus of Control) Questionnaire, the test of parent knowledge regarding PIE training information, and the Joseph Preschool and Primary Self-Concept Inventory. Parents were also asked to complete information regarding demographics, school placement, and extra therapies received.

Each child's teacher will also be asked to provide information. This aspect of testing will occur in the Fall of 1989. Specific procedures to be followed are being discussed.

Fourth posttesting. The fourth posttesting will occur in the Summer of 1990. Feedback based on the third posttesting and analysis of data may influence current procedures, but major changes are not expected.

Results and Discussion

The focus of this section will be on those subjects that have completed one full year of intervention immediately following intervention (Posttest #1) and one year later (Posttest #2). At posttest #2, some subjects received two years of intervention and some had "graduated" to school-age programs. Also, analyses on those subjects who received two years of center-based intervention will be presented.

Comparability of Groups on Pretest Measures

Based on available demographic data (presented earlier in Table 12.2), there was a slight advantage for those subjects whose parents were involved in the Center + PIE group. The Center + PIE group families were better educated, held higher SES occupations, and had a higher annual income.

Additional information on the comparability of groups is presented in Table 12.8. This table presents data from the core measures at pretest for the Center-Only and Center + PIE groups. On the BDI, there is a slight advantage in favor of the Center + PIE group subjects in the adaptive and motor domain areas ($p < .10$).

Table 12.8

Comparability of Groups on Pretest Measures for Des Moines Study

Variable	Center Only $\bar{X}$	Center Only (SD)	Center Only n	Center + PIE $\bar{X}$	Center + PIE (SD)	Center + PIE n	p Value	ES$
• Battelle Developmental Inventory (BDI) * DQs for:								
Personal Social	69.1	(21.2)	42	67.5	(18.5)	34	.73	-.08
Adaptive Behavior	70.5	(17.0)	42	63.0	(22.1)	34	.06	-.44
Motor	71.4	(18.6)	42	62.6	(22.0)	34	.08	-.47
Communication	60.2	(16.3)	42	57.5	(20.6)	34	.52	-.17
Cognitive	65.0	(17.2)	42	68.9	(19.6)	34	.94	.23
TOTAL	66.3	(14.0)	42	62.6	(16.7)	34	.29	-.26
• Parenting Stress Index (PSI) Δ								
Child Related (range 30 to 250)	118.9	(20.4)	41	117.4	(18.4)	34	.73	+.07
Other Related (range 54 to 270)	131.3	(23.73)	41	131.6	(28.8)	34	.97	-.01
TOTAL (range 101 to 505)	250.2	(40.1)	41	248.9	(43.3)	34	.89	.03
• Family Adaptation and Cohesion Evaluation Scales (FACES) †								
Adaptation (range 0 to 30)	6.2	(3.5)	41	3.6	(2.3)	34	.000	.74
Cohesion (range 0 to 26)	5.4	(5.0)	41	4.0	(3.5)	34	.14	.28
TOTAL (range 1 to 40)	8.9	(5.1)	41	5.9	(3.3)	34	.003	.59
Discrepancy (range 0 to 80)	10.1	(9.7)	41	11.9	(7.9)	34	.38	-.19
• Family Resource Scale (FRS) ∞ (range 30 to 150)	118.83	(14.8)	41	116.26	(19.5)	34	.52	-.17
• Family Inventory of Life Events (FILE) Δ (range 0 to 71)	8.1	(4.8)	41	12.0	(8.0)	34	.02	-.81
• Family Support Scale (FSS) Total Score ΔΔ (range 0 to 4)	1.8	(0.7)	40	2.2	(0.8)	33	.06	.57
• Peabody Picture Vocabulary Test Revised (PPVT) &	83.3	(18.1)	40	92.3	(18.3)	34	.04	.50

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

† Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (See Appendix A for details).

∞ Analyses for the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

Δ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

ΔΔ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

& Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

$$ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

The sign (+/-) of the Effect Sizes for the PSI, FILE, and FACES are reversed as lower scores are preferred.

On three of the family measures, significant differences were found between the groups. Based on the FACES, families of the Center-Only group subjects were functioning further from the "ideal" norm than families in the Center + PIE group. This occurred on their total FACES score as well as on the adaptation scale. The results of the FILE indicate that the families of subjects in the Center + PIE group had more major life events occur in the past year than families in the control group. In contrast, scores from the Family Support Scale indicate that families in the Center + PIE group had more sources of support.

Although the families differ on these three measures, their stress ratings (based on the PSI) are not different. Also, resources available to each family (FRS) by group were roughly comparable. Current knowledge of family functioning makes it difficult to interpret the effect these different patterns may have on subject or family functioning as a result of intervention.

Also include on Table 12.8 are scores from mother's performance on the Peabody Picture Vocabulary Test. These results are not outcome variables, even though obtained at posttest. These data are related to the comparability of groups. A significant difference was found between mother's standard scores on this test, with mothers in the Center + PIE group demonstrating higher scores. Standard scores on this test are highly correlated with IQ scores, which have been hypothesized to be related to intervention success.

Overall, these results suggest that any group advantages at pretest favored the Center + PIE group. These advantages occur in regard to demographic factors, to children's skill levels, and to overall family functioning.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses.

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the test and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical $\underline{p}$ value for assuming statistical significance was set at 0.05. If a $\underline{p}$ value between .05 and .10 was found, combined with an effect size above 0.4, this result was considered as having functional significance.

Measures of Child Functioning

Results of posttest data analysis on child functioning for Posttest #1 and Posttest #2 are presented in Table 12.9. intervention.

Posttest #1. After intervention, results from the BDI are not significant on any domain. A significant difference was found on the Joseph Preschool and Primary

Table 12.9

Posttest Measures of Child Functioning for Posttest One and Two for DesMoines Study

		Posttest One											Posttest Two										
		Center - Only				Center + PIE							Center - Only				Center + PIE						
Variable	Covariates&	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES$^{\Delta}$	P Value	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	P Value	ES$^{\$}$
Average length of intervention in months	–	9.0	(0)		42	9.0	(0)		34	--	.00	1.0	12.6	(4.5)		37	14.3	(4.5)		32	2.45	.12	.38
Age in months at posttest	–	59.9	(11.7)		42	59.3	(11.6)		34	.05	-.05	.82	70.9	(12.2)		37	70.9	(12.0)		32	.00	.99	.00
Battelle Developmental Inventory (BDI)*																							
Personal-Social	1,7,12,13	118	(23)	117	42	116	(26)	117	34	.01	.0	.92	134	(26)	131	37	127	(32)	130	32	.11	.75	-.04
Adaptive Behavior	1,7,12,13	73	(15)	72	42	73	(21)	76	34	1.67	.27	.20	89	(18)	86	37	84	(20)	87	32	.38	.54	.06
Motor	1,7,12,13	112	(23)	107	42	102	(29)	108	34	.11	.04	.74	121	(25)	115	37	110	(33)	116	32	.09	.77	.04
Communication	1,7,12,13	58	(16)	55	42	58	(21)	61	34	3.27	.38	.08	68	(19)	65	37	66	(23)	69	32	.84	.36	.21
Cognitive	1,7,12,13	52	(16)	49	42	49	(18)	52	34	.87	.19	.36	66	(23)	62	37	64	(26)	67	32	1.19	.28	.22
Total	1,7,12,13	416	(83)	400	42	398	(104)	414	34	1.20	.17	.25	477	(98)	459	37	451	(123)	469	32	.30	.54	.10
Stanford-Binet Intelligence Scale+	1,7,12,13	76	(19)	74	28	72	(16)	74	19	.00	0	.99											
Joseph Preschool Primary Self-Concept Inventory*	1,7,12,13	20	(6)	18	11	21	(4)	22	7	5.64	.67	.04											

* Statistical Analysis for BDI and Joseph were conducted using raw scores for each of the scales and these are presented.

Δ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

& Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI total; 4 = PSI total; 5 = PSI child; 6 = PSI other; 7 = FACE total; 8 = FACE discrepancy; 9 = FSS total; 10 = FRS total; 11 = FILE total; 12 = PPVT standard score; 13 = income; 14 = mother education; 15 = hours of daycare.

+ Statistical analysis for the Stanford-Binet were conducted using IQ scores.

Self-Concept Inventory (Joseph) in favor of the children in the Center + PIE group. Increased self-concept may be a function of parents learning ways to positively interact with their child as well as of parents learning normative developmental expectations.

Parent attendance at parent training meetings may effect the intervention outcomes. Where parent attendance varied greatly in this study (see treatment verification section), the Analysis of Covariance was repeated using only parents that attended parent training sessions more than 50% of the time. This analysis had little impact on the initial child functioning findings.

Posttest #2. Results from Posttest #2 are also presented in Table 12.9. Information on the Joseph and Stanford-Binet are not included for this analysis. The Stanford-Binet was not administered after the 1986-87 academic year. The results of the Joseph are available, but, at present, only from those subjects who participated in the early intervention program for two consecutive years. As a separate analysis will be presented for these subjects, Joseph data will be presented there. As mentioned earlier, Posttest #2 analyses include subjects who "graduated" to school-age programs as well as those who received two consecutive years of intervention.

The results from the BDI reflect those found at Posttest #1. No group differences were found on any of the BDI domains or total score.

Measures of Family Functioning

Table 12.10 presents data on parent and family functioning for Posttest #1. Information on the subscales of the Parent Stress Index are presented in Table 12.11.

Posttest #1. Families in the Center + PIE group were found to have more sources of support available to them based on scores from the Family Support Scale. It is possible that the support component of the PIE influenced actual or perceptions of support which lead to this finding.

Table 12.10

Posttest Measures of Family Functioning for Subjects Reviewing One and Two Years of Intervention for Des Moines Parent Training Study

	One Year of Intervention															Two Years of Intervention													
		Basic					Augmented									Basic					Augmented							
Variable	Covariates &	X̄	(SD)	Adj. X̄	%	n	X̄	(SD)	Adj. X̄	%	n	ANCOVA F	p Value	ES§	Covariates &	X̄	(SD)	Adj. X̄	%	n	X̄	(SD)	Adj. X̄	%	n	ANCOVA F	p Value	ES§
Parent Stress Index (PSI)#																												
Child Related	1,5,7,12,13	118	(22)	117	86	40	113	(16)	114	80	34	1.10	.30	+.14	4,7,9,14	124	(14)	126	93	14	121	(20)	119	88	19	1.37	.25	.48
Other Related	1,6,7,12,13	134	(24)	134	72	40	130	(26)	130	66	34	1.60	.21	+.17	4,7,9,14	129	(23)	130	66	14	133	(34)	133	71	19	.17	.68	-.14
Total	1,4,7,12,13	253	(40)	252	81	40	242	(38)	243	74	34	2.01	.16	+.23	4,7,9,14	253	(34)	256	84	14	256	(48)	252	81	19	.14	.71	.11
Family Suport Scale (FSS)ΔΔ																												
Total	1,7,9,12,13	1.5	(.8)	1.6		38	2.0	(.6)	1.9		33	4.17	.05	.38	4,7,9,14	1.6	(.7)	1.6		14	2.2	(1.0)	2.2		18	3.62	.07	.77
Family Resource Scale (FRS)Δ																												
Total	1,7,10,12,13	122	(17)	122	57	40	118	(19)	118	50	34	1.46	.23	-.24	4,7,9,14	124	(17)	122	57	14	118	(28)	120	54	19	.04	.83	-.09
Family Adaptation and Cohesion Evaluation (FACES)*																												
Cohesion	1,7,12,13	5.5	(4.4)	5.0		41	4.8	(3.9)	5.3		33	.13	.72	-.07	7,9,14	6.3	(4.1)	4.9		14	4.9	(4.9)	6.4		18	.97	.33	-.37
Adaptation	1,7,12,13	6.3	(3.6)	5.9		41	4.9	(3.2)	5.3		33	.42	.52	+.17	7,9,14	3.2	(2.6)	2.4		14	5.8	(4.1)	6.6		18	8.34	.008	-1.61
Total	1,7,12,13	9.1	(4.3)	8.3		41	7.7	(3.6)	8.5		33	.05	.86	-.05	7,9,14	7.4	(4.2)	5.8		14	8.4	(5.2)	10.1		18	8.18	.008	-1.03
Family Inventory of Life Events (FILE)#	1,7,11,12,13	7.3	(5.4)	8.5	47	40	10.8	(6.9)	9.6	40	34	.96	.33	+.20	7,9,10,14	6.1	(4.9)	6.4	65	14	8.6	(6.2)	8.3	46	19	.79	.38	.38
Child Improvement (Locus of Control) Questionnaire#																												
Professional	1,7,12,13	19	(2.8)	18		41	20	(4.3)	20		34	3.91	.05	-.71	7,9,14	18	(4.4)	17		14	21	(3.5)	22		19	8.58	.007	1.02
Divine Intervention	1,7,12,13	13	(3.3)	12		41	11	(3.5)	12		34	.13	.72	.0	7,9,14	11	(2.8)	10		14	11	(4.0)	12		19	.87	.36	.51
Parent	1,7,12,13	23	(2.5)	23		41	24	(3.1)	24		34	.62	.43	-.40	7,9,14	23	(2.3)	23		14	24	(2.9)	24		19	1.58	.22	.62
Child	1,7,12,13	21	(3.0)	21		41	20	(4.2)	20		34	.68	.41	+.33	7,9,14	21	(3.2)	21		14	18	(3.9)	19		19	1.33	.26	-.32
Chance	1,7,12,13	12	(3.7)	11		41	9	(3.1)	10		34	5.54	.02	+.27	7,9,14	11	(3.3)	10		14	9	(2.8)	10		19	.47	.50	-.24
Total	1,7,12,13	88	(10)	86		41	84	(10)	86		34	.06	.81	.0	7,9,14	85	(11)	85		14	83	(9)	86		19	1.69	.20	.42
CES-D Depression ScaleΔ	1,4,7,12,13	32	(9)	31		40	28	(9)	29		34	.78	.38	-.22	6,7,9,14	28	(6)	29		14	35	(13)	35		19	2.47	.13	.96
Test of Parent KnowledgeΔ	1,3,7,12,13	9	(4)	10		41	16	(6)	15		34	22.34	.000	1.25	7,9,14	12	(8)	13		13	17	(7)	14		18	.49	.49	-.16
Parent as (PAAT)Δ																												
Creativity	1,7,12,13	26	(1.3)	26		11	27	(3.0)	27		8	.83	.38	.77	3,7,9,14	27	(1.3)	27		14	27	(3.3)	27		19	.43	.52	-.50
Frustration	1,7,12,13	27	(1.4)	27		11	26	(2.6)	26		8	.12	.73	-.71	4,7,9,14	27	(2.0)	28		14	27	(3.7)	27		19	1.39	.25	-.68
Control	1,7,12,13	25	(2.8)	25		11	27	(2.1)	27		8	1.23	.29	.71	7,9,14	27	(2.8)	28		14	27	(3.0)	26		19	3.00	.09	-.64
Play	1,7,12,13	27	(2.1)	27		11	29	(1.9)	29		8	2.65	.13	.93	4,7,9,14	30	(2.5)	30		14	30	(3.3)	29		19	.40	.53	-.31
Teaching/Learning	1,7,12,13	25	(7.5)	26		11	30	(2.3)	29		8	1.13	.31	.48	3,7,9,14	29	(2.0)	30		14	30	(3.4)	29		19	.49	.49	-.38
Total	1,7,12,13	130	(7)	131		11	139	(9)	138		8	3.12	.10	1.0	7,9,14	140	(7.0)	144		14	142	(14)	137		19	2.58	.12	-.96
Comprehensive Evaluation of Family Functioning (CEEF)Δ	1,4,7,12,13	88	(15)	89		8	79	(14)	78		8	1.69	.23	-.73	7,9,11,14	81	(14)	85		14	88	(23)	84		17	.03	.86	-.09

§ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI, FACES, FILE, and CIQ the numerator for the ES is calculated as: Basic-Adjusted, as lower scores are preferred.

Statistical analyses for the PSI, FILE, and CIQ were based on raw scores where low raw scores are most desirable.

* Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal where a score of 0 is considered best.

Δ Statistical analyses for the FRS, CEEF, CES-D, Test of Parent Knowledge, and PAAT were based on raw scores where higher scores are preferred.

ΔΔ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

** To assist with interpretation of the PSI, FRS, and FILE an approximate percentile score is reported in the table based on covariance adjusted FRS norms are based on data from Covariates.

& Covariates: 1=BDI adaptive; 2=BDI motor; 3=BDI total; 4=PSI total; 5=PSI child; 6=PSI other; 7=FACE total; 8=FACE discrepancy score; 9=FSS total; 10=FRS total; 11=FILE total; 12=PPVT standard score; 13=income; 14=mother education; 15=hours of daycare.

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Table 12.11

Measures from PSI Subscales for Posttest One for DesMoines Study

		Posttest One										
		Center Only				Center + PIE						
Variable	Covariates[&]	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[$]	P Value
Parent Stress Index (PSI)[*]												
Adaptability	1,4,7,12,13	28	(6.8)	28	40	27	(4.3)	27	34	.44	.15	.51
Acceptability	1,4,7,12,13	16	(3.5)	16	40	16	(3.6)	16	34	.13	.0	.72
Demandingness	1,4,7,12,13	23	(4.7)	23	40	22	(4.5)	22	34	1.31	.21	.26
Mood	1,5,7,12,13	12	(3.0)	11	40	10	(3.0)	10	34	2.41	.33	.13
Distractibility/Hyperactivity	1,5,7,12,13	27	(6.2)	27	40	28	(6.0)	28	34	.55	-.16	.46
Reinforces Parent	1,5,7,12,13	12	(3.3)	11	40	10	(3.0)	10	34	2.88	.30	.09
Depression	1,4,7,12,13	22	(5.7)	22	40	21	(4.3)	21	34	1.44	.18	.24
Attachment	1,4,7,12,13	14	(3.4)	14	40	13	(3.8)	13	34	.70	.29	.40
Restriction of Role	1,4,7,12,13	20	(4.6)	20	40	19	(5.3)	19	34	.96	.22	.33
Sense of Competence	1,4,7,12,13	33	(6.2)	34	40	31	(6.8)	31	34	7.09	.48	.01
Social Isolation	1,4,7,12,13	14	(4.2)	14	40	14	(4.3)	14	34	.83	.0	.79
Relationship with Spouse	1,4,7,12,13	19	(4.3)	18	40	20	(5.7)	20	34	2.13	-.47	.15
Parent Health	1,4,7,12,13	12	(3.0)	12	40	12	(3.9)	12	34	.00	-0	.96

[$] Effect Size (ES) is generally defined as the difference between the groups (Parent Training minus No Parent Training) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the No Parent Training Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI the difference between groups for the ES (numerator) is calculated by subtracting the adjusted scores as No Parent Training minus Parent Training Group, because lower scores are preferred.

[&] Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total' 4 = PSI Total; 5 = PSI child; 6 = PSI other; 7 = FACE total; 8 = FACE discrepancy score; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT standard score; 13 = income; 14 = mother education; 15 hours of daycare.

Differences were found on two subscales of the Child Improvement Questionnaire (CIQ) which assesses locus of control perceptions. The CIQ was designed to measure parental beliefs concerning control over the improvement of physically, emotionally, or developmentally impaired children. A significant difference was found on the chance subscale. This subscale assesses parental beliefs that their child's improvement is largely a matter of fate or of factors beyond their control. Parents of children in the Center + PIE group were significantly less likely to believe that their child's progress was due to fate.

Scores on the professional subscale of the CIQ were also significant. This subscale reflects parental beliefs that child improvement is a function of the

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efforts of professionals. Subscale results indicate that parents in the Center-Only group more strongly believed in the need for professionals to help their child improve.

These results from the CIQ are interesting. For the Center + PIE group, a change away from believing fate is controlling child improvement is a change that may be associated with the PIE. The finding that the increased belief in professionals as improvement agents is decreased is not unexpected if PIE increased parent perceptions of empowerment. One goal of the PIE was to help the parents improve their intervention skills to increase the perceptions of themselves as a factor in their child's improvement. Therefore, change in the parent subscale of the CIQ was expected, but did not occur. This failure to find a difference decreases confidence in the parent empowerment aspects of the PIE.

In addition to the analyses reported in Table 12.10, the subscales of the PSI were analyzed and are reported in Table 12.11. Some caution is suggested when making interpretations based on these results, as the PSI authors recommend against using the subscales for interpretive purposes. These subscales were analyzed here for exploratory purposes. On the subscales, a significant difference was found in parents' stress regarding their sense of competence, with those parents in the Center + PIE group viewing themselves as more competent (less stressed).

Findings of the Parent as a Teacher Scale (PAAT) also provides some interesting findings. On the teaching/learning scale, parents in the Center + PIE group obtained significantly higher scores, indicating more positive attitudes toward their teaching role with their child. Although the p values of the other subscales were not significant (at $p < .10$), the effect sizes obtained were very large and favored the Center + PIE group (with one exception). These large effect sizes suggest that factors being measured by these scales were impacted on by some parents in the Center + PIE groups. Future subgroup analyses will examine various possibilities.

The results from measures of family functioning should be interpreted conservatively. It is possible when conducting as many analyses as were done here that findings of significance may occur, even when groups are comparable. Although the measures where differences occurred are ones which, theoretically, might be affected by the PIE. The overall effects of the Center + PIE intervention on family functioning is negligible.

Posttest #2. Family functioning data for Posttest #2 are presented in Table 12.12. As with the Joseph in Table 12.9, data on the Child Improvement Questionnaire, CES-D, and PAAT are currently available only for those children who received two consecutive years of intervention. These data will be presented in a following section.

Significant differences between groups were found on the FRS and the FACES. On the FRS, parents in the center-only group reported more resources. The FRS is not an outcome measure with respect to this study, thus the difference finding is difficult to interpret.

Families of Center-Only subjects also reported more appropriate family function on the FACES cohesion and total scales. These results suggest family functioning closer to "ideal" functioning. It is possible that these improved FACES scores could be directly related to increased resource levels (measured by the FRS). This hypothesis can be checked with the EIRI longitudinal data base. If these FACES differences maintain over time, it would suggest a negative effect of parent-focused interventions such as the PIE.

Overall, the family functioning results at Posttest #2 suggest that the Center + PIE intervention had an overall negative effect. Families from the Center-Only group are functioning "better" on almost all measures.

Table 12.12

Measures from PSI Subscales of Families of Subjects Receiving One and Two Years of Intervention for DesMoines Parent Training Study

		One Year of Intervention												Two Years of Intervention										
		No Parent Training				Parent Training								No Parent Training				Parent Training						
Variable	Covariates[&]	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[$]	P Value	Covariates[&]	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES[$]	P Value
Parent Stress Index (PSI)[*]																								
Adaptability	1,4,7,12,13	28	(6.8)	28	40	27	(4.3)	27	34	.44	.15	.51	5,7,9,14	30	(4.6)	30	14	28	(6.0)	28	19	1.37	-.53	.25
Acceptability	1,4,7,12,13	16	(3.5)	16	40	16	(3.6)	16	34	.13	.0	.72	6,7,9,14	18	(2.8)	19	14	17	(4.4)	16	19	5.6	-1.23	.03
Demandingness	1,4,7,12,13	23	(4.7)	23	40	22	(4.5)	22	34	1.31	.21	.26	7,9,14	23	(4.5)	24	14	26	(7.0)	25	19	.34	.35	.56
Mood	1,5,7,12,13	12	(3.0)	11	40	10	(3.0)	10	34	2.41	.33	.13	7,9,14	12	(2.8)	12	14	12	(3.5)	12	19	.00	.004	.99
Distractibility/Hyperactivity	1,5,7,12,13	27	(6.2)	27	40	28	(6.0)	28	34	.55	-.16	.46	6,7,9,14	29	(4.3)	29	14	28	(5.6)	28	19	.05	-.11	.83
Reinforces Parent	1,5,7,12,13	12	(3.3)	11	40	10	(3.0)	10	34	2.88	.30	.09	7,9,14,15	11	(3.0)	10	13	11	(4.9)	12	19	1.52	.62	.23
Depression	1,4,7,12,13	22	(3.7)	22	40	21	(4.3)	21	34	1.44	.18	.24	6,7,9,14	20	(5.6)	21	14	21	(7.4)	21	19	.06	-.08	.80
Attachment	1,4,7,12,13	14	(3.4)	14	40	13	(3.8)	13	34	.70	.29	.40	4,7,9,14	14	(3.3)	14	14	13	(3.4)	13	19	.88	-.35	.36
Restriction of Role	1,4,7,12,13	20	(4.6)	20	40	19	(5.3)	19	34	.96	.22	.33	6,7,9,14	18	(4.6)	19	14	19	(6.7)	18	19	1.34	-.36	.26
Sense of Competence	1,4,7,12,13	33	(6.2)	34	40	31	(6.8)	31	34	7.09	.48	.01	6,7,9,14	31	(5.1)	32	14	33	(8.1)	33	19	.01	.04	.92
Social Isolation	1,4,7,12,13	14	(4.2)	14	40	14	(4.3)	14	34	.83	.0	.79	4,7,9,14	15	(3.9)	15	14	14	(5.8)	14	19	.45	-.26	.51
Relationship with Spouse	1,4,7,12,13	19	(4.3)	18	40	20	(5.7)	20	34	2.13	-.47	.15	6,7,9,14	17	(4.5)	18	14	18	(6.6)	17	19	.51	-.26	.48
Parent Health	1,4,7,12,13	12	(3.0)	12	40	12	(3.9)	12	34	.00	-0	.96	4,7,9,14	12	(1.7)	12	14	13	(4.7)	13	19	.74	.49	.40

[$] Effect Size (ES) is generally defined as the difference between the groups (Parent Training minus No Parent Training) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the No Parent Training Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI the difference between groups for the ES (numerator) is calculated by subtracting the adjusted scores as No Parent Training minus Parent Training Group, because lower scores are preferred.

[&] Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total 4 = PSI Total; 5 = PSI child; 6 = PSI other; 7 = FACE total; 8 = FACE discrepancy score; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT standard score; 13 = income; 14 = mother education; 15 hours of daycare.

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Two Years of Intervention Analysis

This analysis is on those subjects that were enrolled in the intervention program for two consecutive years. This encompasses two years of center-based intervention for all subjects, plus PIE I and PIE II intervention for parents of experimental group subjects. These analyses are based on 15 center-only subjects and 19 Center + PIE subjects (see Methods).

Comparability of groups at pretest. The comparability of this group at pretest on demographic characteristics and on child and family measures are presented, respectively, in Tables 12.13 and 12.14. Demographic data for subjects who received two years of intervention (12.13) are similar to those presented in Table 12.2. Mothers in the Center + PIE group have more years of education than their Center-Only counterparts, and more fathers in the Center + PIE group hold occupations placing them in higher SES categories. On other demographic variables, the groups are similar. Any advantage on demographic variables favor the Center + PIE group.

Information on comparability of groups in this subgroup analysis on the pretest core measures are presented in Table 12.14. Significant differences were found between groups on two of the family measures. On the FACES, parents in the Center + PIE group were functioning closer to "ideal" family functioning. Parents in the Center + PIE group also reported higher levels of support on the FSS. These results indicate that the Center + PIE group parents have more of those family features that may contribute to intervention success (c.f., Dunst, 1986). No significant differences were found on the BDI, indicating comparable developmental levels of subjects at pretest.

Child functioning. The results of the BDI and Joseph are presented in Table 12.15 for the groups in this subgroup . A significant group difference was found on the BDI Communication domain. These results differ from those of Posttest #1 and #2 and suggest that either two years of PIE intervention or the PIE II contributed

Table 12.13

Comparability of Groups on Demographic Characteristics for Subjects Receiving Two Years of Intervention for Des Moines Parent Study

	Center Only			Center + PIE			p Value	ES$^{\$}$
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
• Age of child in months at pretest	45.3	(9.9)	15	46.5	(8.7)	19	.71	.12
• Age of mother in years at pretest+	28.3	(5.4)	15	31.0	(4.4)	19	.12	.5
• Age of father in years at pretest+	31.4	(6.8)	12	33.2	(6.7)	16	.49	.26
• Percent Male*+	53.3		15	73.7		19	.23	.42
• Years of Education for Mother	11.8	(2.0)	15	13.3	(2.0)	19	.03	.75
• Years of Education for Father	11.9	(2.7)	12	13.4	(2.7)	17	.17	.56
• Percent with both parents living at home *	73.3		15	68.4		19	.76	.10
• Percent of children who are caucasian*	92.3		15	88.9		19	.76	-.08
• Hours per week mother employed+	4.7	(8.6)	15	7.5	(13.5)	19	.47	.33
• Hours per week father employed+	35.0	(24.8)	11	34.4	(17.8)	16	.94	-.02
• Percent of mothers employed as technical managerial or above*	0		15	0		19	1.0	0.0
• Percent of fathers employed as technical managerial or above*	8.3		12	37.5		16	.06	-.74
• Total household income	$20,346	(21,665)	13	$25,868	(20,509)	19	.47	.25
• Percent with mother as primary caregiver*	100		14	94.7		19	.82	-.07
• Percent of children in day care*+	0		14	0		19	1.0	.00
• Number of siblings +	1.6	(0.7)	15	1.3	(0.7)	19	.17	-.43
• Percent with English as primary language*	100		15	100		19	1.0	.00

Notes: *Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "0"

+Absolute ES values are presented.

$$^{\$}\text{ES} = \frac{\overline{X}\text{ (Center + PIE)} - \overline{X}\text{ (Center only)}}{\text{SD (Center only)}}$$

Table 12.14

Comparability of Groups on Pretest Measures for Subjects Receiving Two Years of Intervention for Des Moines Study

Variable	Center Only			Center + PIE			p Value	ES[$]
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		
• Battelle Developmental Inventory (BDI) [*] DQs for:								
Personal Social	67.5	(13.4)	15	69.0	(17.1)	19	.65	.11
Adaptive Behavior	67.9	(12.2)	15	61.5	(19.5)	19	.44	-.52
Motor	69.2	(18.0)	15	60.3	(17.0)	19	.37	-.49
Communication	58.8	(14.4)	15	55.8	(16.4)	19	.90	-.20
Cognitive	61.1	(17.5)	15	61.1	(18.0)	19	.81	.0
TOTAL	64.6	(11.1)	15	61.8	(14.5)	19	.79	-.25
• Parenting Stress Index (PSI) [Δ]								
Child Related (range 30 to 250)	125.3	(16.2)	15	118	(14.0)	19	.20	.45
Other Related (range 54 to 270)	130.9	(23.1)	15	134.9	(29.3)	19	.67	-.17
TOTAL (range 101 to 505)	256.2	(31.4)	15	253.4	(40.7)	19	.83	.09
• Family Adaptation and Cohesion Evaluation Scales (FACES) [†]								
Adaptation (range 0 to 30)	6.7	(3.6)	15	3.6	(2.4)	19	.004	.86
Cohesion (range 0 to 26)	5.7	(4.4)	15	3.8	(3.9)	19	.18	.43
TOTAL (range 1 to 40)	9.7	(4.1)	15	5.6	(4.0)	19	.007	1.0
Discrepancy (range 0 to 80)	15.3	(10.2)	15	14.2	(7.6)	19	.72	.11
• Family Resource Scale (FRS) [∞] (range 30 to 150)	115.1	(12.7)	15	118.6	(20.1)	19	.53	.28
• Family Inventory of Life Events (FILE) [Δ] (range 0 to 71)	8.1	(4.9)	15	10.7	(6.8)	19	.22	-.53
• Family Support Scale (FSS) Total Score [ΔΔ] (range 0 to 4)	1.8	(0.6)	15	2.2	(0.8)	19	.07	.67
• Peabody Picture Vocabulary Test Revised (PPVT) [&]	86.7	(17.6)	15	94.7	(18.6)	19	.21	.45

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[†] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[∞] Analyses for the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[Δ] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[ΔΔ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[&] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[$] $$ES = \frac{\bar{X}\text{ (Center = PIE) - }\bar{X}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

The sign (+/-) of the ES for the PSI, FILE, and FACES is reversed as lower scores are preferred.

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Table 12.15

Posttest Measures of Child Functioning for Subjects Reviewing Two Years of Intervention for DesMoines Study

Variable	Covariates &	Center - Only $\bar{X}$	Center - Only (SD)	Center - Only Adj. $\bar{X}$	Center - Only n	Center + PIE $\bar{X}$	Center + PIE (SD)	Center + PIE Adj. $\bar{X}$	Center + PIE n	ANCOVA F	ES Δ	P Value
Average length of intervention in months		18	(0)		15	18	(0)		19	-	.00	1.0
Age in months at posttest		62.8	(8.9)		15	66.0	(9.0)		19	1.1	.36	.31
Battelle Developmental Inventory (BDI)*												
Personal-Social	3,7,9,14	123	(20)	123	15	122	(31)	122	19	.06	-.09	.81
Adaptive Behavior	3,7,9,14	82	(17)	81	15	78	(18)	79	19	.11	-.08	.75
Motor	3,7,9,14	111	(23)	109	15	105	(31)	107	19	.04	-.06	.83
Communication	3,7,9,14	60	(16)	59	15	62	(22)	64	19	.85	.29	.36
Cognitive	3,7,9,14	55	(20)	53	15	59	(25)	61	19	2.93	.42	.10
Total	3,7,9,14	430	(90)	425	15	427	(116)	433	19	.18	.10	.68
Joseph Preschool Primary Self-Concept Inventory*	2,7,9,14	19	(5)	19	13	23	(5)	23	17	3.15	.61	.09

*Statistical Analysis for BDI and Joseph were conducted using raw scores for each of the scales and these are presented.

Δ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

& Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI total; 4 = PSI total; 5 = PSI child; 6 = PSI other; 7 = FACE total; 8 = FACE discrepancy; 9 = FSS total; 10 = FRS total; 11 = FILE total; 12 = PPVT standard score; 13 = income; 14 = mother education; 15 = hours of daycare.

to this result. Future analyses separating PIE I from PIE II will help rule out various possibilities.

Significant group differences were found on the Joseph, indicating that subjects whose parents received PIE intervention had a better self-concept. These results replicate those found at Posttest #1. It is possible that some aspect of PIE intervention affected parent/child interactions in such a way as to increase self-concept perceptions. The longitudinal results from the Joseph will be closely examined to determine if this trend remains stable.

Family functioning. Results of parent and family functioning measures are presented in Table 12.16 for groups in this subgroup. Significant group differences were found on the FSS, FACES, Child Improvement Questionnaire professional scale, and PAAT control scale.

If you compare these results to those from Posttest #1, the majority of effect sizes that favored the Center + PIE group now favor the center-only group, and visa versa. The only major exception is the FSS score which significantly favored the Center + PIE groups on both test occasions. Although analyses of this subgroup at Posttest #1 need to occur, these results suggest that sampling error is being measured. This would indicate problems with the measures in use.

The only conclusion that can be drawn is that the only area of family functioning that appears to be affected by the PIE intervention was perceived support (the FSS). Other areas of family functioning, as assessed in this study, were not affected by the PIE intervention.

Treatment Verification Analyses

An initial analysis of the treatment verification data was conducted. The finding of group differences on the intervenor rating of parents (Table 12.6) raised questions regarding the reason for this difference. That is, did the PIE intervention provide parents with skills that enabled them to interact more effectively with teachers or were the ratings the result of other factors (as pretest differences did exist between groups)? The relation of parent attendance at group meetings (by Center + PIE group parents) and parent satisfaction with intervenor ratings were other issues that were of interest.

Correlational analyses were conducted to begin the examination of these issues. Correlations of parent attendance (by Center + PIE group parents), intervenor ratings of parents (for all parents), and parent satisfaction (for all parents) with treatment verification measures, family demographic characteristics, and information

Table 12.16

Posttest Measures of Family Functioning for Subjects Reviewing Two Years of Intervention for Des Moines Study

		Two Years of Intervention												
		Basic					Augmented							
Variable	Covariates &	$\bar{X}$	(SD)	Adj. $\bar{X}$	%	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	%	n	ANCOVA F	p Value	ES[$]
Parent Stress Index (PSI)[#]														
Child Related	4,7,9,14	124	(14)	126	93	14	121	(20)	119	88	19	1.37	.25	.48
Other Related	4,7,9,14	129	(23)	130	66	14	135	(34)	133	71	19	.17	.68	-.14
Total	4,7,9,14	253	(34)	256	84	14	256	(48)	252	81	19	.14	.71	.11
Family Suport Scale (FSS)[ΔΔ]														
Total	4,7,9,14	1.6	(.7)	1.6		14	2.2	(1.0)	2.2		18	3.62	.07	.77
Family Resource Scale (FRS)														
Total	4,7,9,14	124	(17)	122	57	14	118	(28)	120	54	19	.04	.85	-.09
Family Adaptation and Cohesion Evaluation (FACES)														
Cohesion	7,9,14	6.3	(4.1)	4.9		14	4.9	(4.9)	6.4		18	.97	.33	-.37
Adaptation	7,9,14	3.2	(2.6)	2.4		14	5.8	(4.1)	6.6		18	8.34	.008	-1.61
Total	7,9,14	7.4	(4.2)	5.8		14	8.4	(5.2)	10.1		18	8.18	.008	-1.03
Family Inventory of Life Events (FILE)[#]	7,9,10,14	6.1	(4.9)	6.4	65	14	8.6	(6.2)	8.3	46	19	.79	.38	.38
Child Improvement (Locus of Control) Questionnaire[#]														
Professional	7,9,14	18	(4.4)	17		14	21	(3.5)	22		19	8.58	.007	1.02
Divine Intervention	7,9,14	11	(2.8)	10		14	11	(4.0)	12		19	.87	.36	.51
Parent	7,9,14	23	(2.3)	23		14	24	(2.9)	24		19	1.58	.22	.62
Child	7,9,14	21	(3.2)	21		14	18	(3.9)	19		19	1.33	.26	-.52
Chance	7,9,14	11	(3.3)	10		14	9	(2.8)	10		19	.47	.50	-.24
Total	7,9,14	85	(11)	85		14	83	(9)	86		19	1.69	.20	.42
CES-D Depression Scale[Δ]	6,7,9,14	28	(6)	29		14	35	(13)	35		19	2.47	.13	.96
Parent as (PAAT)[Δ]														
Creativity	5,7,9,14	27	(1.3)	27		14	27	(3.3)	27		19	.43	.52	-.50
Frustration	4,7,9,14	27	(2.0)	28		14	27	(3.7)	27		19	1.39	.25	-.68
Control	7,9,14	27	(2.8)	28		14	27	(3.0)	26		19	3.00	.09	-.64
Play	4,7,9,14	30	(2.5)	30		14	30	(3.3)	29		19	.40	.53	-.31
Teaching/Learning	5,7,9,14	29	(2.0)	30		14	30	(3.4)	29		19	.49	.49	-.38
Total	7,9,14	140	(7.0)	144		14	142	(14)	137		19	2.58	.12	-.96
Comprehensive Evaluation of Family Functioning (CEEF)	7,9,11,14	81	(14)	85		14	88	(23)	84		17	.03	.86	-.09

[$] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI, FACES, FILE, and CIQ the numerator for the ES is calculated as: Basic-Adjusted, as lower scores are preferred.

[#] Statistical analyses for the PSI, FILE, and CIQ were based on raw scores where low raw scores are most desirable.

[*] Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal where a score of 0 is considered best.

[Δ] Statistical analyses for the FRS, CEEF, CES-D, and PAAT were based on raw scores where higher scores are preferred.

[ΔΔ] Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

[**] To assist with interpretation of the PSI, FRS, and FILE an approximate percentile score is reported in the table based on covariance adjusted scores. PSI and FILE norms are from the authors' sample. FRS norms are from the EIRI longitudinal base. For the PSI, higher percentiles equal greater stress; for the FILE, higher percentiles equals less stress.

[+] Covariates: 1=BDI adaptive; 2=BDI motor; 3=BDI total; 4=PSI total; 5=PSI child; 6=PSI other; 7=FACE total; 8=FACE discrepancy score; 9=FSS total; 10=FRS total; 11=FILE total; 12=PPVT standard score; 13=income; 14=mother education; 15=hours of daycare.

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from posttest family measures were conducted. Correlations with family measures and the majority of demographic characteristics revealed no significant correlations. Data presented in Table 12.17 represent correlations that provide some interesting findings regarding the current data and raise suggestions for further analyses.

Table 12.17

Correlational Analyses of Treatment Verification Data For Des Moines Parent Training Study

	Parent Attendance[&]		Intervenor Rating[^]		Parent Satisfaction[#]	
Variable	r	p	r	p	r	p
• Mother's education	.32	.07	.56	<.000	.11	.25
• Father's education	.37	.05	.51	<.000	-.03	.41
• Family income	.42	.03	.61	<.000	.15	.17
• Child school attendance	.22	.10	.23	.06	.04	.40
• Parent attendance[&]	—	—	.55	.002	.00	.50
• Intervenor rating[^]	.55	.002	—	—	.06	.33
• Parent satisfaction[#]	.00	.50	.06	.33	—	—
• Child progress[+]	-.12	.26	-.20	.06	.04	.38

Intervenor ratings of parents appear influenced by a number of factors, primarily parent education and income, although child attendance at school and lack of child progress in school also affected intervenor ratings. When these demographic factors were included in an Analysis of Covariance with intervenor rating (sum of the three areas) as dependent variable and treatment group as independent variable, no differences between groups were found (F = 2.46, ES = 0.38, p = .13).

Parent education and income also affected parent attendance at PIE meetings. Perhaps parents with higher levels of education are more comfortable in a class-like setting and are more willing to attend regularly. Unlike parent attendance at meetings and intervenor ratings, parent satisfaction with the center-based intervention program appears unaffected by parent education, child progress, or intervenor perception. A number of possibilities arise: (a) more sensitive measures of satisfaction may be needed; (b) parents may not have a clear idea of what represents a good versus poor program; or (c) parents may be truly satisfied.

These treatment verification analyses raise interesting questions for the field of early intervention. Evaluations in the past have overlooked these variables and as a result may have obtained biased data (Casto & Mastropieri, 1986; Cooke & Poole, 1982). These initial analyses make clear the importance of verification data. Verification data cannot only help clarify results obtained, but also raise new areas for investigation.

Continued analyses. Data analysis for this site is far from complete. Continued analyses will directly examine the effects of PIE II without PIE I included, and the individual effects of PIE I and PIE II on those subjects and parents that received both. Analyses examining the impact of parental factors such as income, education, parent attendance, etc., and treatment group on dependent measures will be examined. These and other analyses, as well as information from follow-up activities, require analysis.

Conclusions

This study investigated the effect on children, parents, and families of placement in a center-based early intervention program supplemented by parent-attended meetings focused primarily on training parents intervention skills, compared to the same program without the parent component. Results of this study indicate that the supplemental parent component did not differentially effect child development or overall parent/family functioning. The supplemental parent component did positively effect child self-concept and parent perceptions of support from others in their environment.

It is clear that the parent component used in this study is only one type of parent involvement possible from a continuum of parent involvement options. The parent component used in this study, though, is representative of the most common approach to parent involvement (White et al., 1989) (i.e., parent meetings focused on training intervention skills as a supplement to a center-based program). The findings from this study do not imply that parent involvement is not beneficial nor that parents cannot be effective interventionists for their child with handicaps. These results only imply that parent involvement, when conducted as described in this study, does not provide immediate benefits for child development or for family functioning.

The two areas that were impacted by the parent intervention, child self-concept, and perceptions of family support, are areas that may have longitudinal benefits. Relating the findings of increased self-concept to an ecological theory of development, it is possible that the parent component changed aspects of child-parent interaction which resulted in better child self-concept. Although this increased self-concept did not affect development, it may affect other behaviors that will allow the child to function better at later ages in school, and perhaps make greater achievement gains that those with poorer self-concepts. This hypothesis will receive examination in longitudinal activities.

Also, related to ecological aspects is the finding of increased perception of sources of support by parents in the training group. The immediate benefit of this perception to the child or family is not clear in this study. An ecological framework for early intervention does suggest that increased support will have positive effects at some point (Dunst, 1986). It will be important in the follow-up of this study to continue assessment of family functioning.

A secondary aspect of this study relates to the findings of positive changes in self-concept and support. This study also investigated the question of whether the focus of the parent meetings should be focused on training parents as interventionists or on the provision of support. The overall results are equivocal on this question. Yet, the self-concept and support findings were associated with each focus of intervention. It is possible that the reported focus of the parent component is not having the primary effect. Some other aspect of the parent component, rather than the reported focus, may be affecting the parents to produce increased perceptions of support and child self-concept. This would suggest that a more thorough analyses of what activities are done with parents occurs.

In interpreting the results of this study, it should be remembered that parent attendance at meetings was far from perfect. However, attendance at parent meetings in this study typifies findings when using lower SES groups (Baker & McCurry, 1984). Regardless of attendance, parents learned the concepts taught in PIE I (Test of Parent Knowledge), at least at a level that allowed them to verbalize information presented. This is probably due to the repeated presentation of critical knowledge in PIE, as in many other parent curricula providing information (Innocenti, Rule, & Fiechtl, 1989). These factors further support the "typical" nature of this intervention.

This study represents a methodologically-sound analysis of parent involvement in the form of parent meetings focused on training parents as interventionists as a supplement to center-based intervention services. The results of this study do not endorse this type of intervention if the goal is to immediately impact on child development or family functioning. This type of parent involvement may be defensible from a social/ethical perspective, and, perhaps, based on the two findings of significance, from a long-term impact perspective (longitudinal data will address this aspect).

Regardless of arguments for or against this type of parent involvement, this study demonstrates that questions regarding parent involvement can be addressed with methodologically sound experimental studies. Research such as this will help to define not only what types of parent involvement "work," but will also help the field of early intervention elucidate its arguments for involving parents. Whatever the role of parents is determined to be, it should be one that is both empirically and logically defensible.

Future Plans

The subject pool is complete for this study. Data from the most recent Posttest (#3) have been coded and entered for computer analysis. These data are in the process of being checked before further analysis occurs. Activities toward testing those few children who have not yet been tested are occurring. In addition, teachers of all "graduated" children are being surveyed regarding child placement and functioning.

The findings of significance in the support and child self-concept areas have raised the possibility of obtaining more detailed parent-child interaction data. Other EIRI sites are finding interesting results from videotaped parent-child interactions. Such information may prove valuable to this study. The possibility of collecting these data are being investigated.

Pat Hollinger will continue to serve as site liaison, the arrangement has been approved by the Des Moines School District. The school district will continue to allow access to the school and records for follow-up activities. This arrangement will benefit all longitudinal activities.

UTAH PARENT INVOLVEMENT STUDY (1986)

Project #13

Comparison: Moderately to Severely Handicapped Children--Center-based intervention plus parent training versus center-based intervention only.

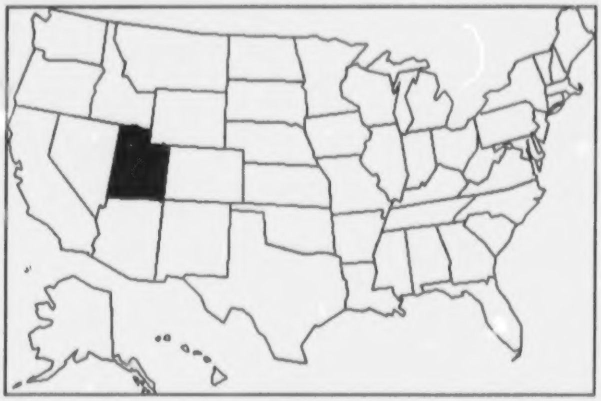
Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Marcia Summers and Glenna Boyce

Location: Salt Lake City, Utah

Date of Report: 10-9-89

Rationale for Study



The involvement of parents in their children's education has long been considered important. White, Taylor, and Moss (1989) identified six rationales frequently cited as to why parental involvement is necessary: (1) Parents are responsible for the welfare of their children; (2) Involved parents provide better political support and advocacy; (3) Early Intervention programs which involve parents are more effective; (4) By involving parents, the same outcome can be achieved at less cost; (5) The benefits of early intervention are maintained better if parents are involved; and (6) Parent involvement provides benefits to parents and family members as well as the child. Although these rationales are frequently given as reasons why parents should be involved in their children's early intervention, there are little data which demonstrates how and if such involvement leads to better child outcomes or benefits for the family (White et al., 1989).

Methodologically sound studies which examine the effects of various types of parent involvement are needed.

Although many kinds of parent involvement exist, (i.e., see White et al., 1989, Table 1), no one program of involving parents has yet been identified as being clearly the best (Powell, 1986). However, using parents as their children's therapist or teacher is by far the most frequent manner in which past research has defined parent involvement (White et al., 1989). Theoretically, parent involvement should produce child gains as parents and teachers become more effective partners working together on behalf of the child.

This study investigated the immediate and long-term effects of a parent involvement program which was primarily designed to improve parents' skills as teachers of their handicapped child. Secondarily, it was hoped that the program would benefit parents by providing them with a forum which allowed them to form liaisons and seek support from other parents with handicapped preschoolers. In addition to assessing the impact of parent involvement with child progress measures, this study assessed the effects of such a program on the family. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1980; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Additionally, most previous studies were conducted with disadvantaged children; moderately and severely handicapped children may present sufficiently different problems so that the relationship between a parent-as-therapist program and overall family functioning may not be present or at least may be different.

This study is very similar to the Utah Parent Involvement 1985 study; it is also very similar to the Des Moines study. This study differs from the Des Moines study in that the children in this study are younger than those at Des Moines and the site for this study, Developmental Disabilities, Inc. (DDI), is a private non-profit agency while the Des Moines study is being conducted at a public school. (The Utah Parent Involvement studies diverge from Des Moines after first posttest in that the Des Moines site implemented a follow-up or maintenance intervention while the Utah studies did not.) This study is close to a direct replication of the Utah Parent Involvement 1985 study in its methodology, although there are slight differences in the instruments used in assessment. (For example, a measure of home environment called the HOME is used in the Utah Parent Involvement 1985 study, but not in the Utah Parent Involvement 1986 study.) For the most part, however, the Des Moines and Utah Parent Involvement 1985 and 1986 studies use the same procedures and methods of assessment. These three studies provide a systematic and concurrent replication of each other. The literature on parent involvement has been severely criticized for the lack of replication and limited generalizability of its studies (Clarke-Stewart, 1982).

Review of Related Research

Historically, the involvement of parents in their children's education has been considered to be a vital component of successful programs for both normal and disadvantaged children. Founded upon a belief in the importance of parent-child interaction and built on the idea that families were the primary source of values and behaviors of children, parent involvement has been seen by many social scientists, practitioners, and advocates as a way to solve a variety of societal problems. The Head Start program, which served as a guide for many subsequent early intervention projects, included a parent involvement component as an integral part of its activities. Bronfenbrenner's (1974) report was especially influential in arguing that early intervention with disadvantaged children was more effective when parents were involved in the program, asserting that the increased participation of parents provided the value change that led parents to encourage and reward their children's learning activities. Lazar's (1981) analysis of 14 studies of early intervention for disadvantaged children with follow-up data reaffirmed this contention in finding that direct participation of parents was significantly related to positive program outcomes.

The benefits associated with parent involvement are believed to be well established both for normal and disadvantaged children. IQ gains and fewer special education placements have been frequently cited in the literature. Haskins and Adams (1982, p. 364), in a critical review of parent education, concluded, "Even a conservative interpretation would indicate that parent intervention programs can, under some circumstances, produce long-term IQ gains in children." Children's sociability and cooperation may also show significant gains (Clarke-Stewart, 1982). Increased infant responsiveness, improvement in children's school performance, and positive effects on maternal behavior (more facilitative language, flexible child-rearing patterns, awareness of parental role as educator) have also been found (Powell, 1986). Some of these effects would appear to be long-lasting; for example, one study found that the Yale Child Welfare parent involvement program still had a positive impact on family circumstances ten years after the intervention had ended (Seitz, Rosenbaum, & Apfel, 1985). Another study found that children of parents involved in long-term parent instruction programs were less likely to be enrolled in special education classes 7 years after the conclusion of the intervention (Jester & Guinagh, 1983). Although these benefits are impressive, a thorough understanding of all the variables involved is not yet complete. In many of the studies which showed substantial child benefits, parent involvement was just one of several components in the interaction programs and the research was not designed to determine which elements were the critical components. Also, Clarke-Stewart, and Apfel (1979) have cautioned that although immediate effects are achieved in general, most follow-up studies show effects are not permanent or very long-lasting. The controversy over the endurance of benefits associated with parent involvement programs points to the need for more longitudinal research in this area.

The research discussed thus far has generally been conducted with disadvantaged children. Because such programs have been considered to be effective with this population (and with more general populations as well), it was logical to extend them into use with families of handicapped children. The number of self-help groups formed by parents of handicapped children would seem to support a felt need for assistance to parents in this area. The recent passage of PL 99-457, which mandates involvement of the family in the young child's education, also asserts the federal government's acceptance of the belief that effective education of the child must include the child's family. Parent education and instructional programs are a frequently used means of attempting to involve families and provide opportunities for parents to learn to work effectively with and for their handicapped children. As Foster, Berger, and McLean (1981, p. 55) noted, "Parent involvement is a good idea that has become an essential and often unquestioned component of intervention programs for young handicapped children."

However, White et al. (1989) have questioned whether parent involvement truly produces positive benefits to children, citing major problems with the integrity of the literature. Few studies of parent involvement with handicapped children were found to be methodologically sound. A number of studies in this area utilize only indirect comparisons (that is, parent involvement is one of several experimentally manipulated variables [e.g., setting or age at start]). Clarke-Stewart (1982) noted that often no control or comparison group is used, and random assignment is almost never featured, giving rise to questions about selection effects.

Other limitations in the research have been indicated. Often, treatment verification has not taken place to confirm that treatment was received by the parent as it was intended by the researcher. Also, the foci of the research has often been limited to child outcome measures. Studies have not been concerned with family effects, although many researchers have argued that the benefits of parent involvement are greater than those demonstrated by the target child (Dunst, 1986). Another limitation is that few studies have given cost-benefit information, despite general claims that parent involvement saves money.

Finally, a major limitation in the research so far stems from the fact that parent involvement can mean many things (White et al., 1989). There are many types of parent involvement, all of which need to be studied, with priority going to those types of parent involvement which are most frequently used. One frequently-used type of parent involvement adds a parent education program to an ongoing child intervention program. Studies are needed to assess the benefits of this type of parent involvement. Such a study needs to be a well-designed longitudinal study that involves replication, random assignment to treatment and control groups, treatment verification, and multiple measures of child and family functioning. Then the numerous questions concerning costs and effects of parent involvement can begin to be addressed.

Overview of Study

The long-term effectiveness of a parent-as-therapist program was investigated in this study, with this being the third annual posttest for the families. The 47 moderately to severely handicapped children had been involved in a 1/2 day, 5-day-per-week, center-based preschool program and have been followed over a three-year period. The parents of 22 of these children took part in the Parents Involved in Education (PIE) program, which consisted of 15 1-1/2 hour weekly training sessions from January through April, 1987. These 22 families will be known as center-based plus parent instruction group (or briefly, the parent instruction group). The parents of the other 25 children (the center-based or comparison group) did not participate in the PIE program. All children were tested prior to, immediately after, and one and two years following the implementation of the parenting groups. Parents also completed measures of family functioning at each posttest.

Method

Subjects

Preschool children and their families who were participating in an intervention program for children with handicaps were considered for inclusion in this study. The preschool intervention program was offered through the services of the Developmental Disabilities, Inc. (DDI), a private, non-profit agency located in Salt Lake City, Utah. The Battelle Developmental Inventory was used as a screening instrument to determine children's eligibility for services. Children scored at least 1½ standard deviations below the mean in at least two areas, or 3 standard deviations below the mean in one area to qualify for services at the center.

Recruitment. Parents of eligible children were sent a letter inviting them to participate in the research, to which 67 responses were received. Nine of these parents were unable to participate due to reasons such as lack of transportation, illness, etc. Thus, 58 subjects were pretested. This inclusion was based on parents' willingness to participate without prior knowledge of treatment group assignment.

The majority of children in both groups were classified as developmentally delayed (14 in the comparison group and 13 in the parent instruction group). Seven children in the comparison group had Down syndrome, while 5 in the parent instruction group had the same diagnosis. Other handicapping conditions included motor impaired (1 comparison, 5 parent instruction), cognitively impaired (1 comparison), language impaired (1 parent instruction), health impaired (3 comparison), multihandicapped (1 parent instruction), and cerebral palsy (3 comparison, 4 parent instruction).

Subject recruitment was completed in November, 1986. Of the 58 families who were pretested, 56, 40, and 47 participated in the first, second, and third posttestings, respectively. (Three more are presently being tested for Posttest #3, but their test results did not arrive in time to be included in the analysis.) The causes for attrition during these three years will be discussed later. Therefore, for this analysis, 47 families were included with 25 in the center-based and 22 in the center-based plus parent instruction group.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups. Prior to the initiation of treatment, parents were either assigned to a group in which they participated in parent instruction based on the PIE curriculum or to a group in which parents received no additional instruction. The parents not receiving the PIE curriculum continued to receive the same level of parent involvement that was previously available through DDI's program for handicapped preschoolers.

In order to ensure the comparability of groups, subjects were assigned to groups randomly, after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their developmental test scores obtained from the Battelle Developmental Inventory and other assessment instruments previously administered as part of the eligibility process for receiving services at the intervention center.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination for the subject with the lowest DQ score, in each age by motivation cell was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups.

Demographic characteristics. Table 13.1 presents a demographic comparison of the parent instruction and center-based groups at pretest time. Twenty-nine subjects were in each group. The mean age for children in the parent instruction group was 41.6 months, and for children in the comparison group was 43.0 months. The only finding of note was that fathers in the center-based group were older (p = .07) than fathers in the parent instruction group. Otherwise, p-values for the demographic variables ranged from 1.0 to .13, indicating that the groups were roughly comparable in terms of demographic characteristics and no significant differences were found between them.

Attrition. Two subjects dropped between the time of the pretest and the post test (both were in the center-based group). One of these subjects cited the birth of a new baby and a language barrier (the subject was a recent immigrant) as reasons for dropping out of the study and out of services altogether. The other subject dropped out of the study because the mother decided to withdraw her child from services at the intervention center. Thus, the sample at first posttest consisted of 56 subjects, of which 29 were in the parent instruction group and 27 were in the center-based (comparison) group.

Data from 40 subjects were available for the analysis of second posttest testing with 16 more subjects not participating. Of these 16, 7 subjects dropped from the study at the time of second posttest due to lack of interest, and 1 subject declined to participate due to the death of the father the week before the second posttest testing. (Conciliatory letters were sent to these subjects, expressing appreciation for past participation and best wishes for the future.) Two subjects moved, one to El Paso and one to Nevada, and we were unable to locate 4 other subjects. (Standard procedure for locating lost subjects is first, to contact next of kin, and second,

Table 13.1

Comparison on Key Demographic Variables of the Center-Based and Parent Involvement Groups in the 1986 Parent Involvement Study

All Subjects Included In Analysis

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
• Age of child in months as of 11/15/86	43.0	10.5	28	41.6	10.6	28	.62	-.13
• Age of mother in years	33.4	5.8	28	31.3	4.5	27	.13	¦.36¦
• Age of father in years	35.9	6.2	27	33.1	5.1	27	.07	¦.45¦
• Percent Male*	57.1		28	42.9		28	.31	¦.26¦
• Years of Education--Mother	13.8	1.7	28	13.5	1.6	27	.54	-.18
• Years of Education--Father	13.8	2.1	28	14.0	2.1	27	.76	.10
• Percent with both parents living at home*	78.6		28	92.9		28	.17	.36
• Percent of children who are caucasian*	82.1		28	92.9		28	.29	.28
• Hours per week mother employed	8.4	13.7	26	6.0	10.7	27	.48	¦.18¦
• Hours per week father employed	42.8	15.5	21	36.4	19.2	25	.23	¦.41¦
• Percent of mothers employed as technical managerial or above*	10.7		28	3.7		27	.43	-.21
• Percent of fathers employed as technical managerial or above*	61.5		26	44.0		25	.23	-.32
• Total household income⁺	\$21,785	\$12,728	28	\$22,480	\$13,237	26	.84	.05
• Percent with mother as primary caregiver*	100.0		28	96.4		28	.57	-.15
• Percent of children in daycare more than 5 hours per week*	14.3		28	7.4		27	.49	-.18
• Number of siblings	2.1	1.7	28	2.3	1.1	27	.70	¦.12¦
• Percent with English as primary language*	96.4		28	96.4		28	1.00	0
• Maternal PPVT (standard)	99.6	18.0	28	99.3	17.1	27	.95	-.02

NOTES:

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

⁺ Income data were converted from categorical to continuous data by using the midpoint of each category.

^ $$\frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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to send a certified letter. For these cases, neither procedure proved successful.) Finally, two children do not have Battelle Developmental Scores, but have family measure scores. Thus, second posttest data was available for 20 subjects in the comparison group and 20 subjects in the parent instruction group.

Forty-seven children were evaluated at time of third posttest (22 in the center-based plus parent instruction group and 25 in the center-based group). Thus, nine families who were tested at posttest #1 were not tested at Posttest #3. Of these nine families, three did not want to be included, three were still in the process of being tested, two live in states where testers have not been located, and one family has moved and has not been located.

A comparison of subjects who remained in the study at the time of the second posttest and third posttest with those who were pretested may be found in Table 13.2 and 13.3, respectively. For Posttest #2, the numbers of families who were not tested were large enough to compare those who remained in the study with those who left, the center-based with the center-based + parent instruction group and the interaction effect between these groupings. At posttest #3, the number of families who were not tested were too small to allow these analyses. Tests of significance were only used in comparing those families tested with those not tested. No statistically significant differences or interaction effects were found. The only finding of note is a trend for children who have left the study to score lower on the Battelle Developmental Inventory ($\underline{p} = .08$) at Posttest #2.

No other statistically significant differences between the group that dropped and the group that remained in the study were found. Considering that many comparisons were made, it would not be surprising to find one "trend" toward statistical significance even if the groups were completely equivalent. Thus, there is no reason to believe that attrition has substantially changed the results of the study.

Table 13.2

Comparison on Pretest Variables of Subjects Who Withdrew from Study With Those Who Completed the Second Posttest in the 1986 Utah Parent Involvement Study

		Center-Based			Center-Based + PIE			Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	Sig of p	F	p	F	Sig of p
Age at Pretest	IN	42.4	11.9	20	41.6	11.6	20	.33	.57	.12	.74	.10	.75
	OUT	44.5	6.1	8	41.7	8.2	8						
BDI Total DQ	IN	58.6	15.5	20	62.0	10.5	20	.77	.38	3.23	.08	.03	.87
	OUT	49.1	18.8	8	54.1	25.9	8						
Total PSI	IN	255.7	53.6	20	257.2	31.7	19	.00	.99	.23	.64	.02	.90
	OUT	251.3	36.4	8	249.5	41.2	8						
Child Related PSI	IN	122.2	25.5	20	118.5	15.8	19	1.10	.30	.02	.88	.21	.65
	OUT	124.1	18.7	8	114.6	22.5	8						
Other PSI	IN	133.6	31.3	20	138.7	20.5	19	.69	.41	.43	.51	.03	.87
	OUT	127.1	29.9	8	134.9	20.2	8						
Education Mother	IN	13.9	1.5	20	13.5	1.5	19	.15	.70	.01	.94	.15	.70
	OUT	13.6	2.2	8	13.6	1.8	8						
Education Father	IN	14.0	2.0	20	13.8	2.1	19	.44	.51	.07	.79	.84	.36
	OUT	13.3	2.3	8	14.3	2.4	8						
Income	IN	$22,325	$13,496	20	$21,944	$10,752	19	.15	.70	.00	.99	.23	.63
	OUT	$20,437	$11,296	8	$23,928	$19,490	7						
FACES	IN	9.0	6.0	20	6.5	2.8	19	1.31	.26	1.45	.23	.52	.47
	OUT	6.4	4.9	8	5.8	2.1	8						
Family Resources	IN	113.2	16.9	20	112.9	16.7	18	.32	.57	.10	.76	.27	.61
	OUT	117.8	22.0	8	111.8	22.6	8						
Family Support	IN	27.53	11.0	19	29.1	9.6	19	.22	.64	1.04	.31	.00	.99
	OUT	31.00	12.9	7	32.7	10.3	6						

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Table 13.3

Comparison on Pretest Variables of Subjects Who Withdrew from Study With Those Who Completed Posttest #3 in the 1986 Utah Parent Involvement Study

								Study Status						
		Center-Based			Center-Based + PIE			In Study			Out of Study			
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	P Value
Age at Pretest	IN	42.8	9.6	25	40.5	11.4	22	41.7	10.5	47	45.6	10.6	9	.31
	OUT	45.1	19.3	3	45.9	5.6	6							
BDI Total DQ	IN	54.0	13.9	25	61.7	10.6	22	57.6	12.9	47	58.8	30.1	9	.85
	OUT	71.2	32.6	3	52.5	29.7	6							
Total PSI	IN	254.8	47.8	25	257.9	33.7	21	256.2	41.5	46	246.8	44.9	9	.54
	OUT	251.3	68.0	3	244.5	36.8	6							
Child Related PSI	IN	122.1	23.9	25	119.0	16.7	21	120.7	20.8	46	116.9	22.0	9	.62
	OUT	128.0	23.1	3	111.3	21.3	6							
Other PSI	IN	132.7	29.4	25	138.9	21.0	21	135.5	25.8	46	129.9	26.9	9	.56
	OUT	123.3	45.1	3	133.2	17.6	6							
Education Mother	IN	13.8	1.7	25	13.5	1.4	22	13.6	1.6	47	13.8	1.8	8	.86
	OUT	13.7	1.5	3	13.8	2.2	5							
Education Father	IN	13.8	2.2	25	13.7	2.0	22	13.7	2.1	47	14.6	2.2	8	.28
	OUT	13.7	1.5	3	15.2	2.5	5							
Income	IN	$21,220	$12,671	25	$20,476	$11,209	21	$20,880	$11,900	46	$29,250	$16,523	8	.89
	OUT	$26,500	$14,933	3	$30,900	$18,899	5							
FACES	IN	8.5	5.9	25	6.1	2.8	21	7.7	4.8	46	5.3	2.7	9	.15
	OUT	6.3	4.9	3	4.7	1.1	6							
Family Resources	IN	112.9	18.4	25	111.6	16.1	20	112.3	17.2	45	119.7	22.0	9	.27
	OUT	127.3	11.6	3	115.8	25.9	6							
Family Support	IN	28.4	11.9	23	28.6	9.7	20	28.5	10.8	43	33.0	7.9	8	.27
	OUT	29.0	6.9	3	35.4	8.17	5							

Intervention Programs

The purpose of this study was to compare a center-based intervention group with a center-based intervention group whose parents participated in parent instructional sessions. A description of these treatments follows.

Basic intervention (center-based treatment). Children in this treatment group attended an existing 3 hour per-day, 5-day-per-week intervention program. Small groups of 9-12 children were instructed by special education teachers who were assisted by paraprofessional aides. The average number of children in the classrooms was 9.75. During a typical day, children were instructed in developmental areas such as motor, speech/language, self help, cognitive, and social skills. Instructional activities were developed from comprehensive assessments. Items were drawn from a number of curricula with no single, specific commercial curriculum being used to determine intervention goals and activities. Children received services in different educational formats (i.e., large group, small groups, and one-to-one) according to their individual needs, based on IEPS from the special education teachers and aides. Teachers were certified while aides were not. In addition, language and motor therapists provided individualized language and motor instruction to the children. These therapists also assisted teachers and paraprofessional aides with implementation of activities.

As part of center-based services to children, parents were involved in IEP meetings. Also, teachers occasionally visited with parents about their child's progress when the parents brought or picked the child up from school.

Expanded intervention (center-based plus parent instruction). Children in this treatment group attended the same center-based program discussed above. In addition, the parents participated in an education program based on the Parents Involved in Education (PIE) instruction package.

One of the major difficulties in doing research on the effectiveness of parent involvement is that the term is often used to mean a wide variety of things. Gatling and White (1987) identified two general types of parent involvement or parent training: (1) Those that use parents in some way to enhance the child's developmental progress (training), and (2) Those that provide assistance to parents or other family members to enhance family functioning, coping ability, satisfaction, or ability to manage the stress of having a handicapped child as a family member (support). About 80% of the studies of parent involvement analyzed by White et al. (1989) used a parents-as-therapist approach as either the sole focus or as the major focus of a parent involvement program which involved several other components. Assistance to the parents or other family members was seldom the major focus of parent involvement programs. Based upon these findings, the parent involvement component for this study (PIE) was structured with a parents-as-therapist focus. However, the PIE instructional sessions also contained an information and a support components.

The PIE curriculum consisted of the following topics: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chairs, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

PIE instructional sessions were taught by a social worker and the director of the intervention center. Average group size consisted of between 8 and 12 parents. Instruction sessions consisted of 15 ninety-minute sessions, once per week excluding holidays, for a period of four months. In addition to the information provided, PIE instructional sessions offered an opportunity for parents to form support networks and discuss challenges associated with parenting a handicapped child.

Treatment verification. A number of procedures were implemented to verify that the intervention program occurred as planned. Child attendance at the center-based program was recorded daily and sent to EIRI on a monthly basis. It can be seen in Table 13.4 that child attendance exceeded 65% for both the parent instruction and comparison group, but that the attendance of the comparison group was slightly higher.

Parent attendance data (for the parent involvement group) was recorded weekly; these data were also sent to EIRI on a monthly basis. Mean parent attendance was 9 (SD = 4.3). A description of quality of parent involvement was also gathered annually by the direct intervenor who worked most closely with the child's mother. The data obtained was the intervener's perception (low[1], average[2], high[3]) of how a parent rated on attendance, knowledge, and support. While the mean ratings for these variables tended to be high (2.62 for attendance, 2.40 for knowledge, and 2.42 for support), nearly half the sample ranked as low or average on one or more of these categories, indicating that interveners were discriminating in the ratings they applied. Both parent attendance and intervener ratings of the parents are typical of the situations experienced by many early intervention professionals who work with parents (Lochman & Brown, 1980).

The parents in the instruction group learned the material that was presented to them. It can be seen in Tables 13.4 and 13.5 that the test of parent knowledge scores were significantly higher for the parent involvement group at first and second posttest time (Posttest #1 $\underline{p} = .01$, and Posttest #2 $p = .03$). In fact, there was no decline in mean scores for either group between posttests. This information indicates that parents in the parent instruction group retained the information taught them in the parent educational workshops.

Table 13.4
Comparison of Treatment Verification Variables for Center-Based and Parent Involvement Group at Posttest #1 for 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
• Test of Parent knowledge	14.0	5.4	28	18.0	5.5	28	.01	.74
• Child's school attendance (%)	68.8	24.8	28	65.6	25.5	27	.64	-.13
• Teacher rating of parent's:$								
Attendance	2.6	.81	26	2.8	.42	24	.00	.25
Support	2.2	.95	26	2.6	.50	24	.00	.42
Knowledge	2.3	.97	26	2.5	.59	24	.02	.21
• Time parents spent with Program staff (minutes)	179.8	169.2	28	85.1	78.6	27	.00	-.56
• Time parents spent working with child in suggested activities (minutes)	231.3	199.0	28	162.2	210.1	27	.22	-.35
• Parent ratings of educational services*								
Staff	3.4	.50	28	3.4	.58	27	.91	.00
Communication	3.3	.61	28	3.4	.64	27	.61	.16
Child's goals/activities	3.2	.57	28	3.3	.61	27	.61	.18
Opportunity to participate	3.3	.65	28	3.5	.51	27	.09	.31
Range of services	3.0	.67	28	3.2	.70	27	.23	.30
Program in general	3.2	.55	28	3.3	.67	27	.48	.18
Child's progress	3.3	.47	26	3.1	.57	23	.38	-.43
• Additional outside services received (hours)								
Speech Therapy: % received more than 1 hour per month	7		27	11.5		26	.62	.17
Physical/Occupational Therapy: % received more than 1 hour per month	10.7		28	10.7		28	1.00	.00
Daycare: % received less than 5 hours per week	100		28	100		28	1.00	.00
Preschool/Head Start: % received less than 5 hours per week	3.6		28	3.6		28	1.00	.00

NOTES:

$ Data are based on teacher ratings of parents' attendance, support, and knowledge range (1-3). Higher scores indicate a better rating.

* Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

^
$$\frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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Table 13.5

Comparisons of Treatment Verification Variables for Center-Based and Parent Involvement Groups at Posttest #2 in the 1986 Utah Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
• Test of parent knowledge	15.0	5.9	20	19.1	4.8	17	.03	.69
• Parent ratings of educational services*								
Staff	3.5	.61	19	3.5	.68	21	.81	.00
Communication	3.7	.56	19	3.4	.75	20	.08	-.54
Child's goals/activities	3.5	.51	19	3.4	.51	21	.78	-.20
Opportunity to participate	3.6	.61	19	3.7	.48	21	.61	.16
Range of services	3.0	.67	19	3.2	.81	21	.43	.30
Program in general	3.5	.51	19	3.4	.87	21	.84	-.20
Child's progress	3.5	.51	20	3.5	.84	19	.86	-.06

NOTES: * Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

^ $$\frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

During the initial year of the project, the site visit was conducted to make sure that the interventions were occurring as planned. The results of that site visit (a detailed report of which is available from the institute) found that all the children participated in essentially the same center-based program, with the major difference being that the parents of the children in the parent instruction group received much more extensive parent instruction than the parents of the children in the other group.

Cost of alternative programs. It is important to determine the cost of adding a parent instruction component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. Haskins and Adams (1982) point out that there is a great need for cost analysis in the area of parent education to provide evidence that such programs will justify their costs by increasing the productivity of parents, their children, or both, and/or reducing the necessity for larger investments in treatment programs at some later date. This study has addressed these issues in part, and will provide more conclusive answers as it follows these children through their school years.

The cost of the basic center-based program and the center-based plus PIE program as described above was determined using the ingredients approach. Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, miscellaneous, and contributed resources. The cost of the center-based plus PIE program is simply equal to the cost of the basic center-based program available to 174 children plus the additional cost of PIE provided to 29 families in 1987-88. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 13.6 presents the cost per child in each of these resource categories.

Table 13.6

Cost Per Child for the 1986 Utah Parent Involvement Study (1987-88)

Resources	Center-Based Program (n = 174)	Center-Based + PIE (n = 29)
Agency Resources		
Direct Service	$2,885	$3,050
Administration	556	586
Occupancy	635	635
Equipment	81	81
Transportation		
Children	9	9
Staff	6	6
Materials/Supplies	47	53
Miscellaneous	27	27
SUBTOTAL	**$4,246**	**$4,447**
Contributed Resources		
Volunteer time	23	23
Parent time	381	1,105
Parent Transportation	1,195	1,265
Miscellaneous	2	2
Subtotal	**$1,601**	**$2,395**
Total	***$5,847***	***$6,842***

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Occupancy charges included the annual rent for the two facilities in which the program was housed, and all utilities, insurance, and maintenance costs. Equipment costs were based on insurance estimates of the market replacement value of all equipment owned by the center, annualized to account for interest and depreciation. In addition, the cost of rental and maintenance of other equipment not owned by the center was determined. Transportation costs were paid by the center for staff home visits, workshop attendance, and errands as well as to subsidize the cost of bringing low-income children into the center. Transportation costs for all other children was assumed by their parents and is estimated under "contributed resources." The cost for materials and supplies and miscellaneous included the annual expense to the program for all consumable items and miscellaneous expenses incurred by each program.

Contributed resources included the value of volunteer and parent time. Community members contributed 426 hours during the year to the program. Parents in the basic center-based program contributed 7,200 hours working in the classroom. Each parent in the PIE group spent approximately 13 hours in instructional sessions, and, assuming that parents followed PIE curriculum requirements, 67 hours working at home with their child. In addition, parents in both groups provided transportation for their children. The cost of child transportation was estimated based on information derived from parents via telephone interview. All volunteer time in the program was assigned the opportunity cost of $9 per hour. Finally, contributed miscellaneous resources included the market value of a computer donated to the program. Thus, the basic center-based program cost $5,847, including the estimated value of contributed resources, and the PIE program added $995 to the cost of the basic center-based program.

Table 13.6 presents results which demonstrate that the addition of parent instruction is fairly inexpensive. (Methods for determining the average cost per child are more extensively discussed in the section of the costs of early intervention.) On the average, the addition of parent instruction to the center-based program only costs about $200 more per child in direct costs to the center. This is mostly due to increased personnel costs, although a small amount goes to supplies. However, when the value of contributed resources is added in, this difference is approximately $1,000, reflecting the addition of the parents' time. This makes the addition of a parent instruction program (e.g., PIE) fairly inexpensive in actual dollars for an already-established center-based program. The question of the relative effectiveness of the parent involvement will be addressed in the results section.

Data Collection

Recruitment, training, and monitoring of diagnosticians. With the exception of one BDI tester, this project used the same diagnosticians for pretest, posttest #1, and posttest #2. All of the diagnosticians have Master's degrees and extensive experience assessing handicapped infants and children. In addition, two of the three testers were enrolled in special education doctoral programs. At Posttest #3, new testers were trained. All were graduate students and experienced in working with children. Although these diagnosticians were aware that research was being conducted, they were "blind" to the specific details and hypotheses of the study. Shadow scoring was conducted on 10% of administrations, and administration of the Battelle was determined to be reliable between testers more than 90% of the time.

Pretest. Pretesting took place in late October and early November of 1986. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory

(BDI), a measure of child's developmental level. The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the center. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index (which measures stress and coping behavior in the parent-child system), Family Support Scale (assesses the availability and helpfulness of different sources of support to families), Family Resource Scale (measures the extent to which different types of resources are adequate in households with young children), Family Inventory of Life Events and Changes (assesses life events and changes experienced by a family unit), and the Family Adaptability and Cohesion Scales (assesses perceived and ideal levels of family functioning). Information pertaining to the reliability and validity of these measures may be found in the first annual report (White & Casto, 1986). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttest #1. Initial posttesting occurred at the end of the school year during the last two weeks of May and the first week of June 1987, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery consisted of the same battery of tests and surveys as the pretest battery as well as some additional measures. For mothers, the additional tests and surveys included the CESD Depression Scale (measures depression), a survey of child health, a Child Improvement Locus of Control questionnaire (assesses parental beliefs about the factors controlling the improvement of their handicapped child), a test of knowledge regarding PIE curriculum, a satisfaction with educational services questionnaire, and the Peabody Picture Vocabulary Test (a measure of verbal intelligence). (Although the PPVT was given at Posttest #1, it was included with the pretest measures as another initial comparison measure, reasoning that attending PIE instruction would not affect the mothers' verbal intelligence.) Children were given the Battelle and the Minnesota Child Development Inventory (MCDI), an additional measure of the child's developmental level from the mother's perception. The posttest BDI and PPVT were administered by trained test examiners who were uninformed of subject's group assignments. Parents were paid a $40 incentive for completing the posttest battery. Additionally, mothers and children were videotaped for 16 minutes using a standardized protocol, and mothers were paid $10.00 for the videotaping session.

Posttest #2. A second posttest was conducted on both treatment groups in June, 1988. No monitoring of parental implementation of training principles took place between the first and second posttesting. Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out various family measures. In addition to family measures, parents in both treatment groups again completed the questionnaire assessing the parents' satisfaction with the educational preschool services and a test of knowledge regarding PIE curriculum. All parents were interviewed and were given the opportunity to comment on their services at the center. The parents who had also received the PIE instruction were asked to discuss their attitudes, knowledge, and satisfaction with the instructional program. They were also asked to discuss how their parenting techniques had changed as a result of the PIE, as well as how they handle stressful parenting. After the completion of both the BDI and parental measures and interviews, parents were compensated $30 for their time.

For those few children (6) who were already in public school, special permission was obtained to contact the teachers of study participants. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for teachers to participate, two brightly colored and usable classroom posters were mailed with the questionnaire. If a teacher was asked to complete more than one questionnaire, an appropriate number of posters was supplied with the use of these incentives. This questionnaire had a 100% return rate.

Posttest #3. A third posttest was taken during the summer of 1989. Procedures for this posttest were similar to that of the second posttest. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, and a demographic survey. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Results and Discussion

This section discusses the comparability of parent instruction and center-based groups at pretest time, and will present the results of comparisons of the two groups in terms of child and family functioning at first, second, and third posttest.

The questions which this analysis seeks to answer are:

1. What are the immediate and long-term effects of parent-as-therapist instruction on the young handicapped child and on the family system?
2. What is the relationship between parent instruction, child characteristics, and family characteristics?
3. Is the magnitude of the effect associated with the degree of parental participation, and how does time affect this relationship?

Comparability of Groups on Pretest Measures

Table 13.7 features comparisons of the 56 subjects who participated in the study on pretest child and family functioning measures. Briefly, it may be seen that the groups do not differ significantly on any measure taken at this time. P-values range from .97 to .11, indicating that the groups may be considered comparable at the time of pretest.

Measures of Child Functioning at Posttest #1, #2, and #3

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical p value for assuming statistical significance was set at 0.05. If a p value between .05 and .10 was found, combined with an effect size above 0.4, this result was considered as having functional significance. In this study, the groups did not differ significantly on any of the demographic variables. Therefore, none were used as covariates. However, certain pretest scores were significantly correlated with the posttest scores and were used as covariates.

Group comparisons: Center-based and parent instruction. The groups were found to be basically comparable on the Battelle and the MCDI developmental Scales (see Tables 13.8, 13.9, 13.10). No significant differences (at the .05 level of significance) were found for the Battelle subscale or total scores at Posttests #1, #2, and #3, or for the MCDI scores at Posttest #1, indicating similar paths of development for the two groups. There were some consistent trends for the personal-social and the cognitive subscales with the children in the parent instruction group scoring higher than those in the center-based group. For the personal social scale, the probability estimates (p) were .06 for each of the three posttests and for the cognitive scale, the p values were .12, .09, and .14. Also, the total Battelle score at Posttest #2 was near the level of significance (p - .07). On the other hand, the MCDI showed no significant findings when given at Posttest #1. Table 13.8 and 13.9 also indicate that no more statistically significant differences were found in the health rating of the two groups at Posttest #1 or #2. In order to understand the implications of these findings, further analyses were completed.

Parent attendance: High, low, and no attendance comparisons. Analyses were performed comparing the Battelle scores of the children whose parents attended most of the instructional sessions (11 or more) with those whose parents attended few sessions (6 or less), and those whose parents were in the center-based and attended no PIE sessions. The relationship between parent attendance at the instructional sessions at the child development measures was found again (see Table 13.11).

Table 13.7

Comparison on Pretest Measures of Center-Based and Parent Involvement Groups in the 1986 Utah Parent Involvement Study

	Center-Based Program				Center-Based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p** Value	ES^
• **Battelle Developmental Inventory (BDI)***										
DQs for:										
Personal Social	62.6	23.3		28	63.4	20.4		28	.90	.03
Adaptive Behavior	57.9	17.8		28	62.6	17.0		28	.31	.26
Motor	48.9	21.2		28	57.4	24.7		28	.17	.40
Communication	51.5	19.8		28	55.0	19.5		28	.50	.18
Cognitive	55.9	21.9		28	58.6	20.3		28	.64	.12
TOTAL	55.9	16.7		28	59.7	16.3		28	.38	.23
• **Parenting Stress Index (PSI) Percentile Rank@**										
Child Related (range 47 to 235)	122.7	23.5	90	28	117.3	17.7	86	27	.34	.23
Other Related (range 54 to 270)	131.7	30.5	70	28	137.6	20.1	76	27	.40	-.19
TOTAL (range 101 to 505)	254.4	48.7	83	28	254.9	34.2	83	27	.97	-.01
• **Family Adaptation and Cohesion Evaluation Scales (FACES)+**										
Adaptability (range 0 to 24)	5.0	2.9		28	4.6	2.7		27	.58	.14
Cohesion (range 0 to 30)	5.5	6.2		28	3.7	2.2		27	.15	.29
TOTAL (range 9 to 54)	8.2	5.8		28	6.3	2.6		27	.11	.33
• **Family Resource Scale (FRS)$@**	114.5	18.2	42	28	112.5	18.3	40	26	.70	-.11
• **Family Support Scale (FSS)$@**	28.5	11.4	52	26	30.0	9.7	59	25	.62	.13
• **Family Index of Life Events (FILE)@**	11.4	6.8	31	28	11.8	6.1	30	26	.82	-.06

NOTES:

* For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

$ Analyses for the FSS and FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better.

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

^ $$\frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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Table 13.8

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #1 in the 1986 Utah Parent Involvement Study

		Center-Based			Center-Based + PIE					
Variable	Covariates[&]	$\bar{x}$[#]	(SD)	n	$\bar{x}$[#]	(SD)	n	ANCOVA F	p Value	ES[^]
• Age in months as of 5/15/87[@]	--	50.0	10.5	28	48.6	10.6	28	.24	.62	-.13
• **Battelle Developmental Inventory (BDI) DQs for:**[*]										
Personal-Social	1, 5	58.5	24.7	28	65.9	21.1	28	3.67	.06	.30
Adaptive Behavior	2	58.1	22.5	28	59.9	18.7	28	.29	.60	.08
Motor	2, 3	56.4	24.1	28	55.4	28.6	28	.11	.74	-.04
Communication	1, 4, 5	55.9	24.6	28	54.8	23.7	28	.16	.69	-.04
Cognitive	2, 4, 5	56.5	22.4	28	61.7	24.9	28	2.46	.12	.23
Total	6	55.8	20.1	28	59.2	18.4	28	2.38	.13	.17
• **Child Health Rating**[@]	--	1.93	.66	28	1.85	.72	27	.17	.68	-.12
• **MCDI (raw)**[@]										
General Development	--	76.0	22.8	28	78.8	23.9	28	.19	.67	.12
Gross Motor	--	21.6	6.4	28	22.3	7.2	28	.15	.70	.11
Fine Motor	--	29.9	6.4	28	30.4	6.7	28	.09	.76	.08
Expressive Language	--	36.9	10.8	28	37.0	11.4	28	.00	.98	.01
Comprehension Conceptual	--	29.8	13.3	28	32.0	15.0	28	.33	.57	.17
Situation Conceptual	--	27.6	7.4	28	27.5	8.7	28	.00	.96	-.01
Self-Help	--	20.8	7.2	28	22.1	7.2	28	.44	.51	.18
Personal-Social	--	22.4	5.8	28	23.5	6.1	28	.42	.52	.19

NOTES:

[#] Covariance adjusted means

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[&] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

[^]

$$ES = \frac{\text{Center-Based + PIE adjusted } \bar{x} \text{ - Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

Table 13.9

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #2 in the 1986 Utah Parent Involvement Study

Variable	Covariates[&]	Center-Based			Center-Based + PIE			ANCOVA F	p Value	ES
		$\bar{x}'$	(SD)	n	$\bar{x}'$	(SD)	n			
• Age in months as of 5/15/87[@]	--	61.4	11.9	20	60.6	11.6	20	.05	.83	-.07
• **Battelle Developmental Inventory (BDI) DQs for:**[•]										
Personal-Social	4	55.1	19.5	20	61.7	11.8	20	3.70	.06	.34
Adaptive Behavior	2, 3	57.9	17.8	20	60.1	12.1	20	.34	.56	.12
Motor	2, 3	57.8	18.6	20	59.9	23.1	20	.39	.54	.11
Communication	4	53.3	25.5	20	54.8	19.4	20	.12	.74	.06
Cognitive	4, 5	57.0	21.7	20	64.7	21.3	20	3.03	.09	.35
Total	6	55.1	16.7	20	59.7	14.2	20	3.62	.07	.28
• **Child Health Rating**[@]	--	1.9	.6	19	2.0	.6	21	.10	.76	.17

Table 13.10

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #3 in the 1986 Utah Parent Involvement Study

Variable	Covariates[&]	Center-Based			Center-Based + PIE			ANCOVA F	p Value	ES
		$\bar{x}'$	(SD)	n	$\bar{x}'$	(SD)	n			
• Age in months as of 5/15/89[@]	--	73.8	9.6	25	71.5	11.4	22	.56	.46	-.24
• **Battelle Developmental Inventory (BDI) DQs for:**[•]										
Personal-Social	4	53.4	21.6	25	61.6	17.7	22	3.72	.06	.38
Adaptive Behavior	2, 3	58.5	21.5	25	61.7	17.8	22	.50	.48	.15
Motor	2, 3	53.4	19.7	25	54.8	23.5	22	.21	.65	.07
Communication	4	50.5	21.5	25	49.6	18.6	22	.06	.81	-.04
Cognitive	4, 5	52.1	18.1	25	58.7	20.8	22	2.23	.14	.36
Total	6	52.9	17.1	25	56.3	16.9	22	1.17	.28	.20

NOTES:

[′] Covariance adjusted means

[@] Results computed among t-tests. Means are not adjusted.

[&] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

[•] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[^]

$$\text{ES} = \frac{\text{Center-Based + PIE adjusted } \bar{x} - \text{Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

Table 13.11

Comparison of Posttest Measures of Child Functioning for Children of Parents Who Attended 11 or More PIE Instruction Sessions, Children of Parents who Attended 6 or Less Sessions, and Children of Parents Who Were in the Center-Based Group

		No Attendance Group			Low Attendance Group			High Attendance Group				
Variable	Covariates&	$\bar{x}^{\#}$	(SD)	n	$\bar{x}^{\#}$	(SD)	n	$\bar{x}^{\#}$	(SD)	n	F Value	P Value
Posttest #1												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	1,2	58.3	26.5	29	62.4	17.3	8	68.5	10.5	12	2.05	.14
Adaptive Behavior	1,2	60.0	24.4	29	57.2	11.1	8	64.2	18.1	12	.92	.41
Motor	1,2	57.8	25.4	29	59.6	35.6	8	56.4	24.0	12	.18	.83
Communication	1,2	57.0	26.2	29	53.8	16.8	8	56.6	23.2	12	.25	.78
Cognitive	1,2	55.5	24.1	29	61.9	20.2	8	65.7	20.9	12	2.31	.11
Total	1,2	57.7	22.1	29	57.3	16.8	8	61.5	14.3	12	.94	.40
Posttest #2												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	1,2	54.0	19.5	20	53.6	12.3	6	68.5	8.6	9	5.93	.01
Adaptive Behavior	1,2	58.0	17.8	20	55.1	8.8	6	65.8	12.5	9	2.02	.15
Motor	1,2	57.6	18.6	20	58.5	28.7	6	63.1	21.3	9	.77	.47
Communication	1,2	52.7	25.5	20	57.3	25.5	6	56.9	15.4	9	.37	.70
Cognitive	1,2	54.9	21.7	20	63.7	23.5	6	69.7	15.4	9	3.01	.06
Total	1,2	55.1	16.7	20	55.7	17.1	6	63.8	10.7	9	4.40	.02
Posttest #3												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	1,2	52.3	21.6	25	53.0	14.5	8	72.1	17.9	9	9.60	.00
Adaptive Behavior	1,2	60.4	21.5	25	56.7	23.0	8	68.6	10.6	9	1.96	.16
Motor	1,2	54.2	19.7	25	53.5	28.7	8	59.8	21.1	9	1.26	.30
Communication	1,2	50.5	21.5	25	45.6	19.5	8	56.3	14.8	9	1.28	.29
Cognitive	1,2	50.6	18.1	25	53.2	22.6	8	67.0	15.8	9	3.98	.03
Total	1,2	53.8	17.1	25	51.4	20.8	8	62.8	11.7	9	3.77	.03

NOTES:

# Covariance adjusted means

& Covariates: 1 = Maternal Education; 2 = Same Scale Taken at Pretest

* For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

No significant differences were found between the groups at Posttest #1, but subjects were tested at Posttest #1 soon after the PIE instruction was completed. At Posttest #2, significant differences favoring the children with high attending parents were found in the personal-social ($p = .01$) and cognitive ($p = .06$) subscales, as well as in the total scale ($p = .02$). Likewise, significant differences were found in the same scales at Posttest #3 (personal social, $p = .00$; cognitive, $p = .03$; and total, $p = .03$). Also, from the table it can be seen that the p value decreases for each scale from Posttest #1 to Posttest #3, except for the adaptive behavior scale where it increases slightly from Posttest #2 to Posttest #3.

These findings seem to indicate that possibly some effect on child development has occurred from their parents attending the PIE instructional sessions. However, there may be other factors which might account for the increased development scores for the children of the high attending parents. For example, the high attenders may differ from the low and no attenders on variables such as motivation, commitment, parenting skills or some of the demographic variables. At this point, these analyses have not or cannot be done.

Parent-child interaction. Another way to investigate possible effects of the instructional program is to measure parent-child interaction. Analysis of the parent-child interaction videotapes using the Maternal Behavior Rating System (Mahoney, Finger, & Powell, 1985) yielded the results found in Table 13.12. Statistical significance of each was computed using t-tests. It can be seen that the parent instruction group is significantly higher in maternal warmth, sensitivity, and responsiveness. Significant correlations were found between parent attendance at the parent group and maternal warmth, sensitivity, responsiveness, use of praise, effectiveness, acceptance, and directiveness (negative). These preliminary analyses suggest that participation in the parent group improves the quality of parent-child interaction.

Table 13.12

Mother-Child Interaction at Posttest #1 for the Center-Based and Parent Involvement–Comparisons and Correlation with Parent Attendance

	Center-Based Program			Center-Based + PIE			P Value	Correlation with Parent Attendance
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Expressiveness	2.8	.75	26	3.2	.80	22	.10	.18 p = .22
• Enjoyment	2.8	.78	26	3.0	.78	22	.39	.11 p = .48
• Warmth	2.9	.69	26	3.3	.65	22	.05	.32 p = .03
• Sensitivity	3.5	.99	26	3.9	.68	22	.07	.28 p = .05
• Responsiveness	2.9	1.05	26	3.5	.80	22	.06	.29 p = .04
• Achievement	3.0	1.0	26	3.2	.92	22	.50	.02 p = .90
• Inventiveness	2.9	.65	26	3.1	.75	22	.31	.05 p = .75
• Praise	2.1	1.16	26	2.5	1.5	22	.33	.27 p = .07
• Effectiveness	3.2	.91	26	3.6	.73	22	.14	.22 p = .14
• Acceptance	3.1	.98	26	3.5	.80	22	.11	.27 p = .07
• Pace	2.7	.78	26	2.8	.75	22	.85	-.04 p = .80
• Directiveness	3.3	1.06	26	3.1	.97	22	.39	-.25 p = .09

Measures of Family Functioning

Results of the analysis of measures of family functioning for the three posttests are shown in Tables 13.13, 13.14, and 13.15, respectively. Overall, no real differences are found between the center-based and the parent instruction groups on any of the posttests. Both groups seem to experience fairly high stress as measured by the Parenting Stress Index with the percentiles for the total stress scores ranging from 75 to 85 over the three posttests. The families in both groups seem to be consistently experiencing more child-related stress than parent-related stress over time.

Table 13.13
DDI86--Family Functioning at Posttest #1

		Center-Based				Center-Based + PIE						
Variable	Covariates$	$\bar{x}^{\#}$	(SD)	%ile	n	$\bar{x}^{\#}$	(SD)	%ile	n	ANCOVA F	P Value	ES^
• **Parent Stress Index** @												
Child Related Range (47 to 235)	0	120.5	22.7	89	28	122.4	16.8	90	27	.17	.68	-.08
Other Related Range (54 to 270)	0	137.0	29.9	75	28	136.1	21.5	74	27	.04	.85	.03
Total Range (101 to 505)	0	256.9	48.4	85	28	259.4	36.4	86	27	.10	.76	-.05
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** +												
Adaptability Range (0 to 24)	0	4.5	2.9		28	3.9	3.2		27	.63	.43	.21
Cohesion Range (0 to 30)	0, 1	5.1	4.5		28	3.2	2.9		27	3.8	.06	.42
Total Range (0 to 54)	0	7.3	4.5		28	5.7	3.3		27	2.55	.12	.36
• **Family Resource Scale (FRS)** &@	0	111.5	23.6	39	28	112.3	19.7	39	26	.04	.85	.03
• **Family Support Scale (FSS)** &@	0	27.9	10.4	50	26	32.1	10.7	66	25	2.69	.11	.40
• **Family Index of Life Events (FILE)** *	0	10.8	7.6	34	28	11.9	6.9	29	26	.51	.48	-.14
• **Child Improvement Locus of Control** @												
Professional		19.0	3.6		28	19.6	3.6		28	.31	.58	.17
Divine Intervention		11.3	3.8		28	10.5	3.3		28	.75	.39	-.21
Parent		24.1	3.9		28	24.6	2.3		28	.29	.59	.13
Child		21.5	3.9		28	20.0	3.5		28	2.18	.15	-.38
Change		9.2	3.0		28	9.8	1.9		28	.73	.40	.20
• **CES-D (depression)** *		36.4	12.4		28	33.4	11.7		28	.89	.35	-.24

NOTES:

* Results computed among t-tests. Means are not adjusted.

# Covariance adjusted means.

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

$ Covariates: 0 = This same scale taken at pretest; 1 = FILE

^

$$ES = \frac{\text{Center-Based + PIE adjusted } \bar{x} \text{ - Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

Table 13.14

Comparison of Posttest Measures of Family Functioning of Center-Based and Parent Involvement Groups at Posttest #2 in the 1986 Utah Parent Involvement Study

Variable	Covariates$	Center-Based $\bar{x}$#	(SD)	%ile	n	Center-Based + PIE $\bar{x}$#	(SD)	%ile	n	ANCOVA F	P Value	ES^
• **Parent Stress Index** @												
Child Related Range (47 to 235)	0	116.1	19.9	85	21	116.1	16.2	85	20	.00	1.00	.00
Other Related Range (54 to 270)	0	128.4	26.3	63	21	136.1	18.4	74	20	2.66	.11	-.29
Total Range (101 to 505)	0	244.3	43.0	75	21	252.4	31.8	81	20	1.15	.29	-.19
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** +												
Adaptability Range (0 to 24)	0	4.3	3.2		21	4.7	2.9		20	.19	.66	-.13
Cohesion Range (0 to 30)	0, 1	4.4	3.8		21	3.6	2.6		20	.59	.45	.21
Total Range (0 to 54)	0	6.7	3.9		21	6.5	3.1		20	.01	.90	.05
• **Family Resource Scale (FRS)** &@	0	115.1	22.7	43	21	114.4	19.6	41	19	.02	.90	-.03
• **Family Support Scale (FSS)** &@	0	30.2	10.5	57	19	31.5	9.9	66	19	.18	.68	.12
• **Child Improvement Locus of Control** *												
Professional	–	24.9	5.2		21	22.7	4.6		19	1.89	.18	-.42
Divine Intervention	–	14.2	4.7		21	11.4	3.9		19	4.19	.05	-.60
Parent	–	28.8	4.8		21	27.8	4.3		19	.40	.53	-.21
Child	–	23.9	4.3		21	23.6	4.3		19	.06	.81	-.07
Chance	–	12.2	3.6		21	10.8	3.0		19	1.60	.21	-.39

NOTES:

* Results computed among t-tests. Means are not adjusted.

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

$ Covariates: 0 = This same scale taken at pretest; 1 = FILE

^

$$ES = \frac{\text{Center-Based + PIE adjusted } \bar{x} - \text{Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

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Table 13.15

Comparison of Posttest Measures of Family Functioning of Center-Based and Parent Involvement Groups at Posttest #3 in the 1986 Utah Parent Involvement Study

Variable	Covariates$	Center-Based				Center-Based + PIE				ANCOVA F	P Value	ES^
		$\bar{x}^{\#}$	(SD)	%ile	n	$\bar{x}^{\#}$	(SD)	%ile	n			
• **Parent Stress Index** @												
Child Related Range (47 to 235)	0	118.4	22.5	87	25	117.7	13.6	87	21	.02	.88	.03
Other Related Range (54 to 270)	0	129.4	27.6	65	25	127.2	16.3	61	21	.15	.71	.08
Total Range (101 to 505)	0	247.9	43.4	78	25	244.8	25.6	76	21	.12	.73	.07
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** +												
Adaptability Range (0 to 24)	0	4.5	2.8		25	4.1	1.9		21	.24	.62	.14
Cohesion Range (0 to 30)	0, 1	5.9	5.8		25	3.9	4.0		20	1.78	.19	.34
Total Range (0 to 54)	0	7.6	5.7		25	6.6	3.3		21	.55	.46	.18
• **Family Resource Scale (FRS)** &@	0	116.6	21.1	48	25	119.0	16.2	51	20	.27	.61	.11
• **Family Support Scale (FSS)** &@	0	30.6	14.3	63	23	26.6	8.0	47	20	1.51	.23	-.28

NOTES:

# Covariance adjusted means.

@ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

$ Covariates: 0 = This same scale taken at pretest; 1 = FILE

^

$$ES = \frac{\text{Center-Based + PIE adjusted } \bar{x} - \text{Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

Both groups of families seem typical in the resources and support that they have as indicated by the percentile scores for the Family Resource Scale and the Family Support Scale. Also, their perceived support and resources were fairly consistent over time from Posttest #1 to Posttest #3.

Three statistically significant, or nearly significant, differences were found. At posttest #1, subjects in the parent instruction group were more likely to be balanced in terms of cohesion (p = .06). At Posttest #2, a significant difference was found in the divine intervention subscale of the Child Improvement of Locus of Control (p = .05). Also, at Posttest #2, parents in the parent instruction group reported more parent-related stress than did the parents in the center-based group (p = .11). However, one or two significant differences out of 36 variables is not at all unexpected due to random fluctuation around the mean. In sum, the families in the two groups seem to be handling their stresses, families, and lives equally well over time, and no advantage is seen for the parents who attended the PIE instructional sessions.

Other Analyses

Parent satisfaction with services. Parents in both groups were satisfied with the services provided (see Tables 13.4 and 13.5). With the ranges of responses (1-4, representing poor to excellent), the mean scores were all 3.0 or above). At Posttest #1, there was a trend for the parents in the parent instruction group to be more satisfied with their opportunity to participate. At the time of the second posttest, there were no significant differences between the two groups' satisfaction with services, with the exception of a trend for the comparison group to rate their ability to communicate with program staff slightly higher.

Interviews conducted with parents at the time of the second posttest revealed that the majority were satisfied with the center-based services they received. Only one parent of the 40 interviewed reported leaving the center's intervention program because of inadequate services. Several reported problems with transportation (6 parents) or scheduling of the child's classes (3 parents). The most frequently cited service mentioned as most helpful by these parents was speech therapy.

Parents who received parent instruction were asked specific questions about their classes. The majority (14) of these 17 parents found the center-based program more valuable than the PIE instruction. However, most reported less stress in their lives after the instruction (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the parent instruction positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. Fifteen of the 17 parents were satisfied with the parent-instruction package and the information provided. Of the two parents who did not report satisfaction, one seemed simply indifferent to the instruction and attributed some of her indifference to her poor attendance (which was due to scheduling conflicts). The other parent did not feel the information was useful and was, therefore, dissatisfied.

P.I.E. instructor effect. Because instructor effects have been previously noted in influencing parent involvement (Hoover-Dempsey, Bassler, & Brissie, 1987), an additional analysis was completed on the posttest data which compared the effect of parenting group instructor on outcome measures for the parenting group. (Two instructors taught the parent workshops; one had one class of 9 parents while the other had two classes which also consisted of 9 parents each.) Table 13.16 presents these results. No significant effect due to instructors was evident on child or family functioning measures.

Intervener ratings. The rating of the parents by the child's preschool teacher at the time of first posttest would appear to have some predictive utility. Because most direct interveners feel confident that they can accurately identify parents who are motivated and engage in a high quality of involvement with the child's intervention program, it was thought that this data might be useful in predicting parental success in implementing the parent program. Table 13.17 shows the correlations between the child's total developmental scores at first posttest and the intervener ratings of the parents. It can be seen that intervener rating of parent attendance

Table 13.16

Comparisons of Effect Due to Instructor at Posttest #1 in the 1986 Parent Involvement Study

	Instructor #1				Instructor #2				P Value
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	
• CES-D (depression)	29.33	5.68		9	35.44	13.73		18	.22
• PSI--Total	245.89	32.38	77	9	259.89	44.27	86	18	.41
• PSI--Child	114.67	18.90	82	9	122.61	17.07	90	18	.28
• PSI--Other	131.22	14.26	68	9	137.28	28.75	75	18	.47
• FACES--Adapt	3.89	2.37		9	5.50	6.73		18	.37
• FACES--Cohesion	6.22	9.43		9	8.22	7.16		18	.54
• FACES--Total	10.11	8.77		9	13.72	11.63		18	.42
• Battelle Total (DQ)	56.45	14.3		9	66.02	14.5		18	.12

Table 13.17

Correlation Between Intervener Ratings of Parents and Children's Total Battelle Scores at Three Posttests in the 1986 Utah Parent Involvement Study

Teacher Rating	Posttest 1 (n = 50)	Posttest 2 (n = 38)	Posttest 3 (n = 42)
Parent Attendance	-.08 p = .60	.08 p = .63	-.06 p = .73
Parent Knowledge	.07 p = .61	.09 p = .59	-.02 p = .89
Parent Support	.23 p = .12	.28 p = .09	.19 p = .22

and knowledge is poorly correlated with children's Battelle scores. Intervener rating of parent support is most highly related to the child's developmental scores at all three posttests; but the correlations are still small.

Other analyses revealed that intervener rating of parent knowledge ($\underline{r}[23] = -.06$, $\underline{p} = .393$) and parent support ($r[23] = .25$, $\underline{p} = .123$) were not significantly correlated with actual parent attendance. Not surprisingly, intervener rating of parent attendance and parent attendance at parent training sessions were significantly and positively related, $r[23] = .47$, $\underline{p} = .011$. (Considering that intervener rating included factors beyond the parent training sessions, such as attendance at IEP meetings, this moderate correlation is as would be expected.)However, in this study, the predictive utility of intervener ratings are not confirmed.

Follow-up teacher ratings. At the time of the second posttest, some children had entered the public schools. Of the 40 children who administered the second posttest, 17 remained at DDI or in similar programs, and 1 had dropped out of school services altogether. The remaining 12 (6 in the parent instruction group and 6 in the comparison) represent those who had moved into the public schools. Because of the small sample size, no real conclusions can be drawn. It appears thus far that few differences are apparent in the two groups as reported by teachers (see Table 13.18).

Conclusions

The primary analyses comparing the center-based group and the center-based plus parent instruction group on both child development and family measures showed that the children and families in the parent instruction group did not have a significant advantage over the center-based group. These are also the primary findings in the 1985 Utah Parent Involvement Study and in the Des Moines Parent Involvement Study.

Table 13.18

Public School Teacher Ratings of Children who had Participated in The 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
● Teacher rating of parent's:								
Attendance	5.0	.89	6	4.5	1.2	6	.48	-.56
Support/Participation	15.8	2.8	6	16.8	5.9	6	.72	.29
Knowledge	12.5	3.5	6	14.2	3.4	6	.42	.48
● % Children eligible for Special Education	100.0		6	100.0		5	---	---
● % Time in regular classroom	16.7		6	12.5		6	.85	
● % Time in self-contained classroom	83.3		6	47.2		6	.21	
● % Time in resource room	0.0		6	0.0		6	---	
● % Time in other classes	0.0		6	20.0		6	---	
● Child's attendance % Good	33.3		2	16.7		1	Not computed due to small sample size	
% Excellent	66.7		4	83.3		5		

NOTES: ^

$$\frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

However, in this study, the analysis of the parent-child interaction tapes showed a significant advantage for the children in the parent-interaction group in the warmth, sensitivity, responsiveness, praise, acceptance, and directiveness. In addition, when the Battelle scores were compared for the children whose parents went to most of the instructional sessions with those scores of the children in the center-based group (and, therefore, did not attend any instructional sessions), the children in the instructional group had a significant advantage in the personal-social and cognitive subscales and in the total scores at Posttests #2 and #3. Consequently, since the findings are not all in agreement, the interpretation is not clear as to whether the children benefitted from their parents learning the techniques and information offered them in the PIE instructional sessions or not. In other words, the question remains, at least in terms of child effects, as to whether there are actual differences between groups as a result of the parent participation in the instruction, or whether it might be a problem of sensitive enough measures. The results of the testing next year, especially the child development measures and the videotape analyses, will help answer this question.

Given that parent instruction is relatively inexpensive, the additional costs involved would appear to be money well spent if additional supporting evidence can be found which demonstrate child and family gains with the addition of a parent instruction program to a center-based preschool intervention program. Since increased parent attendance appears to be associated with higher developmental scores for the child, efforts should be made to encourage parent attendance through incentives or other means. While this might add slightly to the costs of the parenting program, it might encourage parents to remain in the program when they might otherwise drop out.

Future Plans

Next year is projected to be the final year of follow-up for this study. The subjects will be tested with the same battery of tests, including both the child development measure and the family measures used in the past. It will need to be determined whether to use the Battelle Developmental Inventory because some of these children may be near the upper limit of the scale. Videotaping of parent-child interaction will be done. The videotapes from the second posttest will also be analyzed. The Des Moines Parent Involvement study has used measures of child self-esteem. These are being considered in the search of sensitive measures to use. Child adjustment may be a more accurate measure than child development *per se*. Measures of parent self-esteem are also being considered.

ASSOCIATION FOR CHILDREN WITH DOWN SYNDROME (ACDS)

Project #14

COMPARISON: Children with Down syndrome -- center-based program versus center-based program plus Parental Involvement (Individualized Parent Training)

LOCAL CONTACT PERSON: Fredda Stimell, Executive Director, Association for Children with Down Syndrome (ACDS)

EIRI COORDINATOR: Lance Mortensen

LOCATION: Bellmore, NY (Long Island)

DATE OF REPORT: 10-9-89

Rationale for the Study

Perhaps the most persistent of the popular issues concerning early intervention is the generally accepted statement that involving parents heavily in the intervention programs of their children results in more effective intervention services.

In both the early intervention literature (Peterson & Cooper, 1989) and in a recent statute (P.L. 99-457), a case for parental and family involvement has been made. The case in the research literature has been made almost universally. White et al. (1987), in a review of previous reviews of early intervention efficacy, found that parent involvement was the most commonly cited concomitant variable of intervention effectiveness with 26 of 27 reviewers concluding that "more is better."

Public Law 99-457 mandates the development of an Individualized Family Service Plan (IFSP) and requires that a statement of the family's strengths and needs relating to enhancing the child's development be included as well as the major outcomes expected for the child and the family. Thus, given the great emphasis on parent involvement in the field and in legislative mandates, one might surmise that the major issues related to parental involvement have been explored and there is little need for further research. Three provocative findings suggest that this may not be so.

First, Casto and Mastropieri (1986), in reporting the initial results of a meta-analysis of the early intervention research, found that parents could indeed be effective intervenors, but programs that heavily involved parents in addition to primary services provided by professionals did not appear to be any more effective than programs that did not. In addition, they pointed out the fact that most of the studies that had investigated the question of parent involvement directly had been done with disadvantaged rather than handicapped children, had many methodological flaws, used narrow and often inappropriate outcome measures, and did not verify whether parents in high involvement groups actually participated to the extent they were supposed to in the intervention program.

Second, in reviewing outcome measures used in previous intervention research, Casto and Lewis (1984) found that family outcomes have been assessed infrequently in past research, accounting for less than 10% of outcome measures collected.

Third, White et al. (1989), in a review of 172 early intervention studies that included a substantial parent involvement component, concluded that parental involvement studies could be subdivided into two main categories: (1) studies that used parents to assist in some way with the developmental therapy of their children, and; 2) studies in which some type of support was provided to parents and/or family members. They found that 80% of the studies were limited solely or primarily to using parents as developmental therapists for their children, with support service receiving little research attention.

Given the above findings, it was deemed important to further investigate issues related to parental involvement. Since parents were used principally as therapists in 80% of the studies reviewed by White et al. (1989), this issue was chosen for further investigation.

Overview of the Study

The Association for Children with Down Syndrome (ACDS) had a basic parental involvement program in place before this study was begun. This basic program included a nine-week course in effective parenting, parent support meetings, a fathers' rap group, a sibling group, peer counseling, and general family support services from an ACDS social worker. This relatively "rich" parental involvement program provided an opportunity to ascertain if teaching the experimental group parents specific skills in working with their child would be powerful enough to show group differences as previous research has suggested. Specifically, the research question investigated was whether assisting parents in implementing specific teaching strategies would result in significant gains in child and family outcomes over the existing center-based and parent involvement program.

Program organization. The Association for Children with Down Syndrome (ACDS) preschool program was a privately operated program consisting of several program units directed toward children at various developmental levels. The infant program unit was for children from birth to approximately 14 months of age, while the toddler and preschool program was directed to children from 14 months to 5 years of age. At age 5, children were referred to their local public school district's Committee on Special Education for appropriate educational placement.

Curriculum in the program was based on a Piagetian model of development and assumed that young children with Down syndrome follow the same sequence of development as nonhandicapped children and can show gains in developmental skills. The primary goals of the program were to have each child with Down syndrome working at his/her optimal potential by identifying learning strategies and effective teaching techniques for the individual child in all the following developmental areas: gross motor, visual-fine motor, communication (receptive and expressive), self-help (feeding, dressing, grooming, and toileting), socialization (awareness of self, adaptation to environment, adaptive behavior, play skills) and cognitive (object permanence, generalization, and concept development). The intervention program evaluated by this study lasted from September 1987 to June 1988.

An underlying assumption of the program was that interventions should be implemented using principles of behavioral psychology and reinforcement. Behavioral interventions were based upon the applied analysis of behavior, were habilitative, prescriptive, and emphasized positive reinforcements that can occur in the educational environment. The goal was to promote developmentally appropriate and socially accepted patterns of adaptive behavior by reinforcing appropriate behaviors.

ACDS utilized a transdisciplinary approach to the early intervention program consisting of special education teachers, assistant teachers, speech/language pathologists, social workers, psychologists, physical therapists, occupational therapists, nurses, movement and music specialists, volunteers, students and a consulting pediatrician-geneticist. The teacher acted as the team facilitator in integrating the expertise of the entire team. Team meetings were held to discuss the progress of individual children as well as to develop strategies for programming. Staff also met with parents on an individual basis at least once a year or more often as needed.

The curriculum. The basic curriculum for the center based program used a number of published early childhood education and special education curriculums such as: You and your small child (Karnes, M.B., 1982; Circle Pines, American Guidance Service, Inc.); Sequenced Curriculum for the Severely and Profoundly Mentally Retarded and Multiply Handicapped (Kissinger, M. E. M., 1981; Springfield: Charles

Thomas Publisher); Down syndrome programs, University of Washington/Complication of programs (Hayden, A., 1981; Seattle: Child Development and Mental Retardation Center, University of Washington); Time to begin (Dmitrieu, V., 1982; Milton, WA: Caring, Inc.).

A typical instructional day included sensory integration, small and large group instruction (in all areas of development), individual task time, and free exploratory play activities. Throughout the day a range of therapeutic services were implemented for goals such as eye to eye gaze, orientation to name, attending skills, and other adaptive behaviors. As children got older, activities were planned to emphasize independence and functional skills in order to prepare children for integration into the least restrictive environments. Data collected from children's IEPs, formalized assessments, informal behavioral observation and standardized checklists were used for program evaluation.

As noted earlier, there was a pre-study parent involvement program in place. The parent involvement activities are described below.

Optional intervention services. In addition to the basic program for each group, ACDS provided a variety of additional activities and services for families who chose to participate. Families in either the Basic or Expanded Services group were eligible to participate in these services. Most of these services were provided through the social work/family services department. These services included:

Fathers Meetings - A father's rap group was held several times each year in the evenings and was led by a social worker.

Coffee and Conversations - All parents were invited to group meetings held once per month to gather information, discuss concerns and bring up relevant issues.

Home Visits - Home visits were made on a monthly basis for infants. Toddler families were visited twice yearly. The minimum number was once per year. Families with acute needs received more home visits on an 'as needed' basis.

STEP - Systematic Training for Effective Parenting (American Guidance Service), a program designed to enhance parenting skills, was offered in a nine-week course.

Siblings - Siblings were invited on a specifically planned day to participate in a shortened school day. A series of sibling raps were offered to inform siblings about Down syndrome, enabling them to meet other siblings of children with Down syndrome and provided siblings with an opportunity to express concerns and feelings.

Share - A group meeting was held once per month for the parents of students graduating from ACDS. This was designed to help prepare parents to separate from ACDS, familiarize themselves with the child's needs, become advocates for their children and to understand the available public school programs for Special Education.

Peer Counseling - Peer counselors were parents of children with Down syndrome who received systematic training through the Family Services Department to advise, counsel and provide support and information to new parents. Peer counselors were available to go to the hospital or the home when new babies with Down syndrome were born. Peer counseling was designed to be short-term and time-limited.

Social Work Services - The social workers served as liaison between the transdisciplinary team and parents. They offered referrals, resources, and concrete services such as: referral to social services, public assistance, food stamps, day care, etc., as well as providing direct care information for out of state families and agencies. The social worker assisted the child's family and teacher in developing strategies for working with the individual family as well as to help facilitate a parent-professional partnership. Conferences, relating to issues concerning children with Down syndrome and their families, were scheduled. A systematic information data base on all other related services and agencies was established and maintained.

Personnel

Services were provided by a multidisciplinary staff of 75 people who served approximately 130 Down Syndrome children. Each child was provided services by a transdisciplinary team that has been assigned to that child. The way in which the staff were incorporated into the program is described next.

Teachers/Assistant Teachers were the primary facilitators of the team. M. S. level special educators were responsible for knowing each child's IEP that has been designed with each team member's input.

Social Workers interfaced with teachers to develop strategies for working with individual families and facilitated a parent-professional relationship.

Psychologists provided child assessment (formal and informal) and parental counseling and training.

Registered Nurses cared for youngsters who did not feel well, and acted as a resource to keep parents and staff up-to-date on health and safety issues.

Speech Pathologists provided the children at ACDS with an intensive speech and language therapy program both on an individual and group basis to minimize the severe delay in the area of language development and speech most children with Down syndrome exhibit.

Physical Therapists followed a neurodevelopmental and sensory integration approach where each child was brought through the stages of development using the prior stage's components as a building block for the next stage.

Occupational Therapists at ACDS worked within the child's occupation (i.e., play), by evaluating and developing a course of therapy to enhance sensory, gross and fine motor, activities of daily living and behavioral and perceptual skills.

The Movement and Dance Specialist worked with children from their earliest months at ACDS. Music, which is stimulating and expressive, helped motivate each child to learn and to use his/her body coordination.

Volunteers (including student and community residents) who came to ACDS from the surrounding communities were trained in specific tasks within the educational program.

Methods

Subjects

All children in the study had Down syndrome. There were 23 preschoolers in the basic parental involvement group and 26 in the expanded parental involvement group.

Recruitment. The project served families with children with Down syndrome in Suffox and Nassau Counties, New York state. A few children from surrounding counties on Long Island were also served through interagency agreements. Subjects qualified for inclusion in the study if they had a diagnosis of Down syndrome. They were then matched according to their performance on the Uniform Performance Assessment System (UPAS) and randomly assigned to the existing parental involvement program or to the expanded parental involvement program. Children who had Down syndrome and other complicating conditions (need of additional family support, severe developmental delay, seizures or other medical difficulties) were enrolled in the ACDS "Extended Day Classroom," and were not included in the study. All families in the program were invited to participate through written announcements and group discussions led by program staff and EIRI personnel. All families who elected to participate underwent an informed consent procedure and signed consent forms. A few families chose not to participate due to personal reasons and to involvement in other research.

Assignment to groups. Developmental level in months was measured by the child's score on the full Uniform Performance Assessment System (UPAS) that was administered by classroom teachers in the fall of 1986. Names were listed in six groupings by chronological age of the child. Groups were: 0-13 months; 14-20 months; 21-28 months; 29-36 months; 37-45 months; 46-58 months. The list also included information concerning sex of the child and whether the child had a heart condition. The first two names on the list were considered a pair, the third and fourth a second pair, and so on through the list. In each of the pairs the first member was assigned a group by the use of a table of random numbers. The other member of the pair was assigned to the other group.

Demographic characteristics. The basic parental involvement group and expanded parental involvement group were compared for gender distribution and heart condition and found to be similar. Tables 14.1 and 14.2 depict demographic characteristics and show pretest performance for children in each group. As may be noted, both Groups were statistically significantly different at pretest in only one area at the .05 level and 3 additional areas at the .10 level. The expanded intervention group reported fewer stressful life events at time of pretest (p = .05). This variable and the years of education for fathers (.06) were used as covariates in posttest analyses

Subject attrition. One child died of a respiratory condition during 1988. This subject was the only attrition the study suffered. Twenty-six children and their families were treated during the 1987-88 year and were the group used for follow-up. Twenty-three children and their families constituted the comparison group.

Intervention Programs

Children participating in both groups received the same basic center-based program, which included the types of parent involvement described above. Those children in the expanded parental involvement program received additional individualized parent involvement activities. The content of both programs is described below.

Table 14.1

Comparability of Groups on Demographic Characteristics for New York Study

	Basic Intervention			Expanded Intervention					
Variable	$\bar{X}$	SD	n	$\bar{X}$	SD	n	p Value	ANOVA F	ES
• Age of child in months as of 7/1/88	33.3	(14.9)	23	34.1	(15.0)	26	.86	.03	+.05
• Age of mother in years	36.6	(4.8)	20	35.1	(5.1)	24	.74	.11	-.31
• Age of father in years	37.1	(5.1)	20	36.6	(5.6)	24	.78	.08	-.10
• Percent Male*	52.2	---	23	53.9	---	26	.91		
• Years of Education for Mother	14.4	(1.8)	23	14.2	(2.0)	24	.68	.17	-.11
• Years of Education for Father	15.4	(1.8)	22	14.2	(2.2)	24	.06	3.85	-.67
• Percent with both parents living at home*	100	---	23	92	---	24	.16	2.0	-.41
• Percent of children who are are Caucasian*	100	---	23	100	---	24	1.00	.00	.00
• Hours per week mother employed	7.0	(11.1)	23	8.6	(13.7)	24	.68	.18	+.14
• Hours per week father employed	42.4	(7.3)	19	41.8	(5.8)	18	.79	.07	-.08
• Percent of mothers employed as technical/managerial or above*	17.0	---	23	17.0	---	24	.95	.00	-.02
• Percent of fathers employed as technical/managerial or above*	52.4	---	23	71.4	---	21	.20	1.7	+.39
• Total household income	$52,045	($22,994)	22	$55,304	($20.724)	23	.62	.25	+.14
• Percent of income spent on unreimbursed medical/educ. expenses for child	4.0	---	16	2.0	---	13	.43	.62	+.30
• Percent receiving public assistance*	4.3	---	23	11.5	---	24	.33	.98	-.29
• Percent of children in daycare more than 5 hours per week*	4.4	---	23	4.4	---	23	1.0	.00	.00
• Number of siblings	1.4	(1.1)	23	1.6	(1.2)	23	.70	.15	+.18
• Percent with English as	100	---	23	100	---	23	1.0	.00	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Table 14.2

Comparability of Groups on Pretest Measures for New York Study

	Basic Intervention				Expanded Intervention						
	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANOVA F	ES[^]	P Value
● Age in months at Pretest	32.3	(14.9)		23	33.1	(15.0)		26	.03	+.05	.86
● Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal Social	75.4	(28.0)		23	82.1	(34.8)		26	.54	+.24	.46
Adaptive Behavior	48.5	(27.3)		23	51.1	(17.2)		26	.33	+.10	.57
Gross Motor	40.0	(19.9)		23	40.3	(17.7)		26	.00	+.02	.96
Fine Motor	21.9	(21.4)		23	23.8	(8.9)		26	.67	+.09	.42
Receptive	13.9	(36.9)		23	15.0	(5.4)		26	.63	+.03	.43
Expressive	16.5	(25.1)		23	18.6	(7.8)		26	1.03	+.08	.32
Cognitive Total	25.4	(7.5)		23	27.1	(8.9)		26	.51	+.23	.48
TOTAL	241.7	(77.3)		23	258.4	(95.1)		26	.45	+.22	.51
● Parent Stress Index (PSI)[']											
Child Related (range 50 to 235)	102.2	(17.2)	60	23	104.0	(20.9)	64	25	.10	-.10	.75
Other Related (range 54 to 270)	119.4	(33.6)	46	23	114.5	(25.8)	40	25	.33	+.15	.57
TOTAL (range 101 to 505)	221.5	(46.9)	50	23	218.4	(44.9)	46	25	.05	+.07	.82
• Family Adaptation and Cohesion Evaluation Scales (FACES)[*]											
Adaptation (range 0 to 24)	5.22	(3.0)		23	3.69	(2.8)		25	3.36	+.51	.07
Cohesion (range 0 to 30)	4.42	(3.4)		23	5.21	(3.0)		25	.18	-.23	.67
Discrepancy (range -80 to 80)	12.1	(8.0)		23	9.4	(9.5)		25	1.1	+.34	.30
TOTAL (range 0 to 80)	7.74	(3.2)		23	6.92)	(3.0)		25	.85	+.26	.36
• Family Resource Scale (FRS)[&]	126.2	(17.5)	65	23	132.2	(16.4)	75	25	1.52	+.34	.22
• Family Support Scale (FSS)[&]	36.8	(11.2)	77	23	32.6	(12.8)	69	25	1.47	-.38	.23
• Family Index of Life Events (FILE)[']	10.0	(6.6)	40	23	6.4	(5.9)	69	26	3.95	+.55	.05

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size.

['] Statistical analysis estimates for PSI and FILE were based on raw scores where low raw scores are more desireable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated by the family as being available. Higher scores are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies.

Basic intervention. Both groups received the basic services of the ongoing ACDS center-based programs. This program varied depending on the age of the child as described below.

Infant Classes were held at the school two times per week where parents and infants met for individual direct service programming with the transdisciplinary team. Individualized programs were developed and implemented during two hours of direct services. At each session, parents received written suggestions and printed educational materials for them to continue working on at home. Pertinent workshops were presented on a monthly basis, which also included rap sessions for parents. In addition, monthly home visits were made by the infant teachers. Specialists may also have accompanied an infant teacher on a home visit. The infant program included children of age 2 months to 14 months. An average day included:

9:30 - 9:45	Movement therapy which included dancing and exercising
9:45 - 11:30	Direct services, with parents, infants, transdisciplinary team members to individualize sensory stimulation programming
11:30 - 12:30	Parents from morning and afternoon classes meet for Rap with the Family Services Department. During this time the children remain in the infant classroom with the transdisciplinary team and interventions are continued. Afternoon Class - p.m. Parents come to classroom after Rap and follow same schedule as above.

The Toddler and Preschool Classes were held at the school for three hours a day five days per week. Children were transported via bus or by their parents to the school. Notebooks were used for daily communication between staff and parents. Formal parent-teacher IEP conferences were held a minimum of twice per year. Parents received a mid-year and year-end developmental report on their child's progress. Individual and group social services to the families were available on an "as needed" basis. Home visits were made by staff members on a twice yearly basis. An open door policy was maintained for the first few weeks of the toddler program or for any child starting school for the first time in a preschool class to facilitate the child's adjustment to the classroom. Parents were otherwise requested to schedule visits a minimum of once per month to see appropriate personnel and to participate in the classroom programming and learn techniques that they could carry out at home with their child. Workshops were offered to parents on topics of interest by specialists from ACDS as well as outside professionals. A typical daily schedule for a younger toddler included:

9:30 - 10:00	Sensory stimulation/free play
10:00 - 10:45	Small group activity. Children are taken from the group for individual work on developmentally appropriate tasks and to receive therapy.
10:45 - 11:00	Large and small group activity as well as painting, shaving cream, rice, water, and other sensory play.
11:00 - 11:30	Gross motor activity. Obstacle course with tunnels chairs, ladders, etc. Also circle time to teach concepts such as in-out, on-off, and to play drums, bells, or sticks. Music to learn name, eye to eye gaze, attending skills/feeding skills.
11:30 - 12:00	Lunch time
12:00 - 12:30	Language circle, learn words and free play while getting ready for bus.

A typical daily schedule for an older toddler included:

9:30 - 10:00	Exercise gross motor and sensory stimulation
10:00 - 10:45	Individual task and therapist time, small group/free play
10:45 - 11:00	Large and small group, arts and crafts using sensory materials
11:00 - 11:30	Gross motor course, concept circle, teaching songs and name identification.
11:30 - 12:00	Lunch/feeding
12:00 - 12:30	Free play, story, group activities
12:30	Dismissal

Process for selecting child's goals. Children in all units were trained on specific individual skills as determined by the following procedures.

- Behavioral observation of child by teacher/OT & PT/speech therapist/psychologist using checklists as guideline.
- Transdisciplinary team meeting to discuss the developmental needs of the child.

- Specific target behavior selected and criteria for acquisition of behavior determined in transdisciplinary team meeting.
- Baseline behavior observed on target behavior by psychologist or trained observer in classroom using General Observation Sheet.
- If work on behavior was appropriate as seen by baseline observation it is discussed with parents.
- Teacher and/or other staff members trained to implement in classroom.

The pool of potential behaviors to be addressed as a part of the intervention program came from developmental assessments made by physical and occupational therapists, speech therapists, and teachers. Each of these professionals used assessment tools that emphasized their particular training expertise. For example, the teachers used the Uniform Performance Assessment System (UPAS), a curriculum-based criterion referenced scale which divides developmental skills into: pre-academic, communication, social/self-help, gross motor categories, and includes a specific inappropriate behavior checklist. Items for the UPAS were taken from existing developmental scales.

Professionals trained in disciplines other than teaching used instruments and procedures designed to focus on child developmental status in those areas of specific expertise of the particular discipline. For example, physical therapists assessed mobility skills, and occupational therapists assessed functional movement patterns. Speech, language, and communication skills were assessed by the speech therapists. Items from all of these child performance assessments were collected on checklists that were kept in the child's folder and updated daily. Rather than relying on the memory of those working with the child, the exact number of occurrences of specific behaviors of each child were observed and recorded.

After data from various instruments and clinical assessment were summarized during weekly staff meetings, behaviors that the child was ready to learn were isolated and staff discussed the child's current overall functioning to select the most salient behaviors to be addressed as a part of the intervention for that child.

Parents gave routine written and verbal input on areas of concern to them. These areas were observed and assessed by staff. When all of these measures had been integrated, the situation was discussed with parents and specific training sequences were developed that included the child's most immediate needs and the materials and rewards that were most effective with the child.

Although any of the over 100 pages of items on the transdisciplinary assessment instruments could have been identified as the child's most appropriate and significant learning need, certain skills were identified more frequently as being needed by children with Down syndrome in the birth to five year age range. Behavioral training programs had previously been written for some 60 skills. Additional programs were written as the process described above had identified other skills pertinent to a particular child's development. Each of these programs was described as a specific sequence with suggestions for rewards and criteria for completion included. These training programs were implemented by the staff in the center-based program.

Expanded intervention. Parents in the expanded parental involvement group received the same services as parents in the Basic Services Group except they were also given additional services designed to enhance their abilities to tutor their child in specified skill areas. A series of videotapes were developed by project staff to use in training parents to teach certain specified skills to their child.

Five basic areas were covered on the tapes. They included: (1) having the child come to the parent; (2) compliance training; (3) preacademic, quantitative, and linguistic learning; (4) toilet training; and (5) prosocial behavior. The videotapes were made by the school psychologists and used live actors for realism. Examples were interspersed with the training of the parents for each category. Practical examples were used (such as rewarding the child for coming when called) so parents could easily see what the desired behavior was and how to reinforce it.

ACDS staff who were experienced in working with parents had found that although parents might learn to teach one skill effectively, and there may have been general understanding of a new concept, it was necessary to train parents for each new skill. The videotapes targeted compliance behaviors as well as skills in critical developmental areas.

The parents in the expanded intervention group were trained individually in the use of the procedures to teach the skills needed by the child and were asked to work with the child at home. This training included teaching the parent the procedures to be used and criteria for attainment of the skill. Parents were then required to demonstrate their ability to teach the skill. Repeated contact was made by a licensed psychologist. Training included a monthly 1 hour face-to-face individual tutorial session, and weekly follow-up telephone calls by the same psychologist.Parents were also be given a written copy of the training sequence and a calendar-like chart to keep a record of home training completed. Parents used the record as a prompt to tell the psychologist during the weekly call of the amount of training activities performed. The project social worker also contracted parents to ensure that the parents' intervention activities were proceeding smoothly. When a child reached criteria on each skill, a new program was implemented on the next target skill to be trained.

Treatment Verification

A number of procedures were used to verify that treatment was implemented as intended. They included:

Collection of attendance data. Child attendance in the regular program was recorded. The parent's attendance at training sessions was also recorded. Reasons for any extended absences were recorded. Experimental group children attended an average of 170 days. Comparison group children averaged 174 days in attendance.

Optional service attendance. As seen in Table 14.3 both the basic and expanded groups had approximately the same attendance to the optional services. Because so many different optional services were offered it was thought expedient to check parents' attendance at activities in case there was a difference between the basic and expanded groups.

Table 14.3

Optional Service Attendance for Basic and Expanded Services Groups

	Basic		Expanded	
Activity	N	(%)	N	(%)
Back-to-School Day	16	(70)	19	(73)
Sibling Day	13	(57)	13	(50)
Father's Breakfast	9	(40)	11	(42)
Holiday Party	8	(35)	11	(42)
IEP Conference	18	(78)	23	(88)
Special Friend's Day	10	(43)	6	(23)
Average Number of Parent Participation in Classroom*	4.1	(46)	3.9	(43)
TOTAL NUMBER OF FAMILIES	***23***		***26***	

*Parents were asked to participate once a month in the classroom. There were a total of nine times (9 months) parents were asked to participate.

Parent report of tutoring at home. Parents in the expanded services group were called weekly to report to the psychologist who performed the individual training of the amount of training actually implemented each day and to discuss any problems occurring during tutoring.

Site review. A formal site visit was made June 1, 1988 by the site coordinator and Diane Crutcher, who was then the Executive Director of the National Down Syndrome Congress. The site review was conducted by Carol Tingey of USU, Diane Crutcher, Executive Director of the National Down Syndrome Congress, Emily Lewis, Assistant to the Executive Director of the Association for Children with Down Syndrome, and Fredda Stimell, Executive Director of the Association for Children with Down Syndrome. Two parents from the program also participated. The site review was conducted as part of the treatment verification process, which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews for EIRI Research Sites, which is found in Part II of the handbook.

The site review team members evaluated the program through information gained from observations of early intervention, interviews with the service delivery staff, examination of the child folders, and inspection of the facility. The site review team evaluated the program in four categories: (1) services for children, (2) interactions between staff and children, (3) curriculum, and (4) administration and management. A complete description of the site review is available upon request.

The results of the Services to Children category showed that appropriate assessment procedures are used, both at entry and at periodic times, and that every child folder checked had a current IEP with input from parents as well as the staff.

Results from the Interaction Between Staff and Children category showed that children received both individualized attention and the opportunity to appropriately act independently. The curriiculum activities were appropriately designed, and the classroom environment was bright and attractive. The Administration and Mangement category also showed signs of exemplary status, as the ACDS staff is both well qualified and evaluated regularly. The supervisory board meets at least monthly, and the professional advisory board at least biannually. In sum, results of the site review indicated that all criteria were fully met in all categories. Based on these findings, no further recommendations were offered.

Cost of alternative programs. The cost for the basic center-based program and the center-based plus parent involvement program was determined using the ingredients approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive listof resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been eengaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several year, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

For both programs, ingredients included direct service and administrative staff, occupancy, equipment, materials and supplies, miscellaneous, and contributed resources. The cost of the center-based plus parent involvement program is simply the cost of the basic center-based program available to 121 children plus the additional direct service, administrative, materials and supplies, miscellaneous, and parent resources required to operate the parent involvement program for 26 children during 1987-88. Table 14.4 presents the cost per child of these resources consumed by each program in 1990 dollars and at several discount rates.

Table 14.4

Cost per Child for New York ACDS (1987-88)

Resources	Center-Based	Center-Based & Parent
1. **UNDISCOUNTED**		
Agency Resources		
Direct service personnel	$ 7,603	$ 7,956
Administration	552	620
Occupancy	1,128	1,128
Equipment	128	128
Materials/supplies	239	284
Miscellaneous	299	321
SUBTOTAL	**$ 9,949**	**$10,437**
Contributed Resources		
Volunteer Time	1,566	1,566
Parent Time	0	726
Transportation	2,500	2,500
SUBTOTAL	**$ 4,066**	**$ 4,792**
Total	***$14,015***	***$15,229***
2. **DISCOUNTED (3%)**		
Total agency resources	$10,872	$11,405
Total resoruces	15,315	16,641
3. **DISCOUNTED (5%)**		
Total agency resources	$11,517	$12,082
Total resources	16,224	17,629

NOTE: Totals may not add up due to rounding errors.

Direct service and administrative personnel costs included the base salaries plus benefits according to the percentage of FTE allocated to each program.

Occupancy charges included the annual rent the ACDS program paid for the facility in which it is housed, an annualized cost for capital improvements, as well as utilities; and insurance costs. Equipment costs were based on insurance estimates of the market replacement value of the buildings' contents, which were annualized to account for interest and depreciation. Materials and supplies and miscellaneous charges were based on actual expenditures by each program on these resources. Contributed resources included parent and volunteer time and child transportation. Community members volunteered 13,400 hours, and student interns volunteered 435 hours. The estimate of parent time is based on the time parents spent in training sessions, telephone contact with the sociologist and psychologist, and the time recommended by the program for working at home with their child. Total parent time was estimated at 72 hours. While program records were available for the amount of time parents spent in training and in phone contact, parent time spent working with their children at home was not available and was thus estimated based on what the program recommends. In addition, pediatric and cardiological examinations were contributed by the medical community. The cost for medical team visits were based on their market value. Finally, the State of New York provided door-to-door transportation for the children at no direct charge to ACDS or the parents. The cost of this service is estimated based on a survey of preschool special education transportation costs (Escobar et al., 1988).

Data Collection

Outcome data were collected for children and families in both groups in the spring of 1988. Measures were selected to measure the effects of the program on both children and families in a way that allowed comparison to other studies of early intervention as well as focusing in on some of the unique questions generated by this particular study.

Recruitment, training, and monitoring of diagnosticians. An assessment coordinator and five diagnosticians were trained at the site by the EIRI assessment coordinator on September 2 and 3, 1987. The coordinator was a licensed school psychologist and had experience working with children who have Down syndrome. The diagnosticians had experience and training with assessment for children with handicaps. All assessment personnel reached criteria on training materials, and pre- and posttesting for 1987 was completed without difficulty. The protocols were essentially error free.

Pretesting. After parent consent was obtained and children were assigned to groups according to their scores on the UPAS, parents were contacted and individual appointments were made with parents for the pretest battery consisting of: Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE) and the Family Adaptability and Cohesion Evaluation Scales (FACES III). The BDI was administered by a trained diagnostician who was not involved in providing other services to the family or the project and who was unaware of the child's group assignment. Testing occurred at the center where services were provided to all families. Parent report measures were completed by the parents and returned to the diagnostician coordinator.

Pretesting in the Fall of 1987 was completed during the month of September. Parents were each paid $20 for participating. Since the newly trained personnel all had considerable experience testing preschool children in other early intervention projects in the area, their experience with children and families made the testing procedure run smoothly. Data concerning the children's progress on the UPAS was collected in the regular methods and was included in the information concerning pretest status of the children.

Posttesting. Posttesting occurred during the last two weeks of May and the first week of June 1988. Appointments were made by the diagnostician coordinator and assessments were completed by trained diagnosticians who did not provide other services to the family or the project and who were unaware of the child's group assignment. In addition to the pretest measures, the child's progress was measured on the Vineland Adaptive Behavior Scale (to show behavioral attainment), Receptive Expressive Emergent Language Scale (REEL) (to show communication competence), and the Uniform Performance Assessment System (UPAS) as an additional measure of child gain, and the child's behavioral style or temperament was assessed using the Carey Temperament Scale. Parent's skill in working with the child on the target behavior was recorded on video tape for analysis. A 3-point scale was developed to code the parent and child interaction on these tapes. The degree of involvement of the parents as reported by the staff was further delineated to get more accurate information concerning the effectiveness of the additional parent training. In addition to progress as measured by the formal assessments, children were videotaped in the classroom on the target behaviors. These teacher/child tapes were scored similar to the parent/child tapes.

Results and Discussion

Results of posttest measures of child and family functioning are presented in Table 14.5. Results of the child functioning measures indicate that there were no statistically significant differences at posttest between the basic and expanded intervention groups on any of the measures.

The results of posttest measures of family functioning appear as Table 14.6 From this table, it may be seen that there were no statistically significant differences at posttest between the groups. The consistent low effect sizes also demonstrate how little difference there actually was between these two groups. The FACES total score was significant at the .10 level and seems consistent with the

Table 14.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for New York Study

		Basic Intervention Group				Expanded Intervention Group						
Variable	Covariates[&,*]	$\bar{X}$	(SD)	Adj.$\bar{x}$	n	$\bar{X}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES[^]
• Age in months at posttest		40.6	(15.5)		23	41.1	(14.9)		26	.01	.91	.03
• **Battelle Developmental Inventory (BDI)**[*]												
Raw Scores												
Personal Social	1,2,3	83.6	(27.2)	88.3	23	92.7	(31.0)	88.5	26	.00	.97	.01
Adaptive Behavior	1,2,4	54.4	(13.1)	55.7	23	58.1	(13.7)	57.0	26	.42	.52	.10
Gross Motor	1,2,5	46.6	(15.2)	47.2	23	45.3	(14.7)	44.8	26	1.63	.21	-.16
Fine Motor	1,2,6	28.8	(8.2)	30.0	23	20.0	(9.9)	29.0	26	.34	.56	-.12
Receptive	1,2,7	16.5	(5.0)	17.3	23	16.9	(3.4)	16.2	26	1.53	.22	-.22
Expressive	1,2,8	20.1	(6.8)	20.8	23	20.5	(7.5)	19.9	26	.45	.51	-.13
Cognitive	1,2,9	29.7	(9.8)	30.9	23	31.7	(10.6)	30.5	26	.08	.78	-.04
BDI Total	1,2,10	283.2	(78.3)	294.9	23	295.3	(25.4)	284.9	26	1.11	.30	-.13
• **REEL** (Age Equivalent)												
Receptive	1,2,11	21.0	(10.5)	22.3	22	21.6	(9.0)	22.2	26	.39	.54	-.01
Expressive	1,2,12	16.2	(10.8)	15.2	22	17.6	(11.0)	18.4	26	.87	.36	.30
• **UPAS** (Age Equivalent)	1,2,13	31.8	(12.4)	33.5	23	32.9	(14.3)	31.4	26	2.62	.11	-.17
• **Vineland**												
Raw Scores												
Receptive	1,2,7	20.2	(3.8)	20.6	23	20.7	(3.1)	20.3	26	.10	.76	-.08
Expressive	1,2,8	16.8	(9.2)	17.7	23	19.2	(11.3)	18.3	26	.08	.78	.07
Daily Living Skills	1,2,10	38.4	(16.6)	41.6	23	41.3	(20.0)	38.5	26	1.86	.18	-.19
Socialization	1,2,3	41.3	(7.8)	42.7	23	43.2	(10.3)	41.9	26	.15	.71	-.10
Gross Motor	1,2,5	20.7	(7.5)	21.2	23	21.0	(7.0)	20.6	26	.41	.53	-.08
Fine Motor	1,2,6	13.1	(4.4)	13.8	23	13.9	(4.8)	13.4	26	.21	.65	-.09
Adaptive Behavior	1,2,10	64.8	(13.0)	64.3	23	66.2	(13.3)	66.7	26	.43	.52	.18
• **Carey**[#]												
Child's Temperament	1,2	3.4	(.3)	3.4	23	3.3	(.3)	3.3	23	1.40	.24	.33
Mother's View of Child	1,2	2.0	(.9)	1.9	23	2.0	(1.0)	21.0	20	.34	.56	.22

[&] Covariates are all raw scores except where noted: 1 = Pretest FILE; 2 = Education of Father; 3 = BDI Pretest Personal/Social; 4 = BDI Pretest Adaptive; 5 = BDI Pretest Gross Motor; 6 = BDI Pretest Fine Motor; 7 = BDI Pretest Receptive; 8 = BDI Pretest Expressive; 9 = Pretest Cognitive; 10 = BDI Pretest Total; 11 = BDI Receptive HE; 12 = BDI Expressive AE; 13 = BDI Total AE

[*] The means for basic or expanded education of father pretest scores were used in place of missing data so computations could be made. There was one missing basic and two missing expanded education of father pretest scores.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[#] On the Carey scale, all child indices were averaged into one score. The possible ranges were from 1 (perfect baby) to 6 (most difficult baby), thus higher scores are worse. The mother's view of child was rated as: 1 = worse than average; 2 = average; 3 = better than average.

Table 14.6

Posttest Measures of Family Functioning for Alternative Intervention Groups for the New York Study

Variable	Covariate[♣]	Basic Intervention Group $\bar{x}$	(SD)	Adj$\bar{x}$	%ile	n	Expanded Intervention Group $\bar{x}$	(SD)	Adj$\bar{x}$	%ile	n	ANCOVA F	P Value	ES[^]
Parenting Stress Index (PSI)[♠]														
Child Related (range 50 to 235)	1,2,3	108.7	(18.8)	108.8	71	23	104.4	(15.2)	104.3	64	24	.68	.41	.24
Other Related (range 54 to 270)	1,2,4	113.7	(30.1)	111.9	35	23	110.5	(20.7)	112.2	35	24	.00	.98	-.01
TOTAL (range 104 to 505)	1,2,5	222.3	(44.7)	220.8	49	23	214.7	(29.3)	216.1	45	24	.15	.70	.11
Family Adaptation and Cohesion Evaluation Scales (FACES)[*]														
Adaptation (range 0 to 24)	1,2,6	5.6	(3.7)	5.2		23	4.0	(1.9)	4.2		23	1.19	.28	.27
Cohesion (range 0 to 30)	1,2,7	4.7	(4.1)	5.3		23	4.9	(3.6)	4.1		23	1.41	.24	.29
Discrepancy (range 0 to 80)	1,2,8	10.9	(9.2)	11.1		23	11.6	(16.6)	11.4		23	.01	.94	-.03
TOTAL (range 0 to 54)	1,2,9	8.3	(3.8)	8.4		23	6.7	(3.4)	6.3		23	3.50	.07	.55
Family Resource Scale (FRS)[&]														
Time Availability	1,2,10	40.9	(10.7)	42.4		23	44.0	(8.3)	42.6		24	.00	.93	.02
External Support	1,2,11	25.5	(3.5)	25.6		23	26.0	(4.0)	25.9		24	.07	.79	.09
TOTAL	1,2,12	126.4	(15.1)	128.2	66	23	129.3	(12.2)	127.6	52	24	.02	.89	-.04
Family Support Scale FSS[&]	1,2,13	33.4	(10.3)	33.4	66	23	30.8	(12.3)	30.7	63	24	.58	.45	-.26
Family Index of Life Events (FILE)[♠]	1,2	8.3	(5.5)	7.0	62	23	7.5	(6.9)	8.7	47	24	1.21	.28	-.31

[♣] Covariates: 1 = Pretest FILE; 2 = Pretest Education of Father; 3 = Pretest Child PSI; 4 = Pretest Other PSI; 5 = Pretest Total PSI; 6 = Pretest Adaptation; 7 = Pretest Cohesion; 8 = Pretest Discrepancy; 9 = Pretest FACES Total; 10 = Pretest Time Availability; 11 = Pretest External Support; 12 = Pretest FRS Total; 13 = Pretest FSS.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size.

[♠] Because high raw scores are related to low percentiles, low raw scores and high percentiles are considered better.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal studies.

trend of the FACES subscales, but because of the large number of analyses done it is more than possible that this difference is due to sampling error.

A series of further analyses were done to test for other group differences. The first analysis tested whether actual attendance of parent and family members at optional family events, such as the father's breakfast and sibling rap groups, was associated with higher scores on child and family measures. This analysis did not reveal any significant differences between attenders and non-attenders. Next, the amount of time handicapped children in both groups spent in day care was examined to see if a relationship existed between amount of time in day care and scores on posttest measures. There were no significant differences on this measure. Finally, videotaped records of parent/child and teacher/child sessions were reviewed to determine if group differences existed. Results of this analysis showed no difference in the parent-child nor in the teacher/child interactions.

Conclusions

As noted earlier, the rationale for doing this particular study was the thought that equipping parents with specific skills to use in enhancing the developmental progress of their children would augment the regular parental involvement program enough to result in significant differences between experimental and control groups on project outcome measures. Much previous research had suggested that this would be the case. Instead, there were few differences between the groups on project outcome measures. The most logical explanation for this finding is that the expanded parental involvement program was not significantly different enough or intense enough to produce group differences. An alternative explanation would be that the effects of the existing intervention program itself were so powerful that the parental involvement component contributed very little to intervention effectiveness. We conclude from the findings of this study that teaching parents specific skills required to enhance the developmental progress of their infants and children was not powerful enough to improve on gains made through the regular intervention program.

ARKANSAS SCHOOL FOR THE DEAF

Project #15

COMPARISON: Hearing Impaired Children -- Oral versus total communication (TC) training.

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LOCATION: Little Rock, Arkansas.

DATE OF REPORT: 10-9-89

Rationale for the Study

Over the years there has been a nation-wide controversy regarding the communication mode used in educating hearing impaired children (Greenberg & Calderon, 1984). Some argue that total communication provides children with a better chance at early, critical language and cognitive development and most adequately prepares them for life in hearing and deaf communities. Alternatively, some argue that oral communication provides children with a better chance of developing oral language skills they will rely on most in the hearing world. Arguments accompanying these two stances are complex and the controversy remains largely unresolved. Despite the heated nature of this controversy, little well-controlled research has been conducted addressing the issue of the comparative benefits of each mode of communication used as an aspect of early intervention. This investigation compared the effects of two modes of communication as alternative forms of intervention on overall development of preschool children with hearing impairments, with particular emphasis on language skill development. Since increasing emphasis in early intervention is placed on family-related needs and involvement, the impact of communication mode on family functioning was also addressed.

Review of Related Research

While proponents of oral/aural (use of spoken communication and development of residual hearing, hereafter referred to as "Oral") and total communication (use of spoken language and development of residual hearing complemented by formal sign language and/or informal gestures, hereafter referred to as "TC") have long argued the relative benefits of these two approaches to education of children with hearing impairments (White & Stevenson, 1975), empirical evidence in support of one method over the other remains inconclusive. Grove and Rodda (1984) reviewed studies indicating that children in TC programs had better cognitive and language skills than children in Oral programs, while Nix (1981) reported only studies with the opposite findings in his review. The studies reviewed by Nix led him to question claims made by proponents of TC programs that children's auditory and verbal skills are enhanced by the use of signs.

Research directly comparing Oral with TC approaches has been conducted using quasi experiments with matched samples (e.g. Greenberg, 1980; Vernon & Koh, 1970), or have evaluated the use of a particular communication mode using a pretest-posttest design. Further, very little data on early intervention with hearing impaired preschoolers, per se, are available. We have been able to find only two studies of early intervention with hearing impaired children which have comparatively addressed the Oral/TC issue. In one of these studies, Greenberg (1980) found no statistically significant differences in communicative competence among children who received Oral/aural or total communication training, but did report that TC children had longer, more complex interactions with their mothers than Oral children did. These differences in parent-child interaction may have implications for family functioning. Moores (1974) compared children (2½ to 4½ years of age) in seven preschool programs over a four year period. Four of the programs used an Oral/aural approach, one used TC, and two used the Rochester method (i.e., word for word finger-spelling) at the start of the study, but by the end of the fourth year, only one program was still using the Oral/aural approach. Despite this confound, Moores concluded that early use of TC is a significant predictor of success in both communication skill and academic achievement. While the Greenberg study had fewer design flaws than Moores's study, both contained threats to their internal validity, such as questions about the comparability of children in the two groups, inadequate descriptions of intervention strategies, and questionable adequacy of the measures used.

This study addressed issues raised in prior studies of hearing impaired children by using random assignment to groups, careful description of children and families included, selection of assessment measures that focus on communication skills as well as cognitive and general development, and continuous monitoring of treatment implementation. To establish the comparability of children in each of the groups, data are presented regarding aided and unaided hearing losses of participating children, their ages, length of exposure to Oral and/or TC programs, pretest scores on the Battelle Developmental Inventory (BDI), a parent rating of general health, indication of other services received, and parent hearing status. Family demographic measures are also presented, including socioeconomic status (SES), number of siblings and adults in the home, and racial group membership. The intervention strategy is fully described, and measures of child progress include instruments that were either developed specifically for hearing impaired populations or have been specifically adapted for use with hearing impaired children.

Methods

The Arkansas School for the Deaf preschool network consists of 10 center-based preschool sites throughout Arkansas, five of which participated in this study. Each teacher at these five sites identified at least four children and their families willing to participate in the research program, and these children were enrolled in the project. The participating sites were located in Fayetteville, Forrest City, Fort Smith, Little Rock, and Russellville, Arkansas.

A three hour, two-day-per-week, center-based program for hearing impaired children was conducted at the five sites. In addition, the preschool teachers made home visits to the families in both groups using the SKI-HI program for home intervention with families of hearing impaired children. A comprehensive set of treatment verification procedures were employed to document both treatment group differences and overall program quality.

Subjects

A total of 32 children and their parents were included as subjects in the study. The following section will summarize the methods used in recruiting and assigning subjects to treatment groups. Additionally, results of the assignment to groups will be presented with respect to demographic characteristics and hearing loss and attrition that was experienced during the course of the three year study.

Recruitment. Children participating in the early intervention programs at the Arkansas School for the Deaf qualified for participation in the research on the basis of their degree of hearing loss. They had an unaided hearing loss of at least 50 decibels (DB) in the better ear. An unaided hearing loss of between 50 and 90 DB was considered moderate to severe, and a loss greater than 90 DB was considered profound. Children with additional handicapping conditions were not eligible, with the exception of one child in the study who had mild cerebral palsy.

Parents of all children who met these criteria were contacted and given information about the research, and signed consent was obtained for approximately 90% of these children. Recruitment for this study ended in October, 1987.

Assignment to groups. Children were randomly assigned to Oral or TC groups after stratification by level of hearing loss within preschool site (stratified by moderate or profound losses). After stratification according to hearing loss, subjects were randomly assigned to groups by the EIRI coordinator to ensure that no program staff had knowledge of what program a particular child would receive. For a complete description of the assignment procedures, see the 1986 Annual Report of the Early Intervention Effectiveness Institute.

Subject attrition. As can be seen in Table 15.1, a total of 10 subjects dropped out of the study between pretest and the third posttest. Attrition was gradual. Thus, the first and second posttests have considerable more subjects than the third posttest. The main reason for attrition was parental preference toward a different mode of communication, although two of the subjects dropped out because they moved out of the state and could not be located. One subject was not located for the second posttest but was located for the third posttest.

Table 15.1

Summary of Attrition at the Arkansas Hearing Impaired Study

	Oral Communication	Total Communication	Total
Pretest	n = 16	n = 16	32
Posttest #1	n = 14 Attrition = 2	n = 16	30
Posttest #2	n = 12 Attrition = 2	n = 13 Attrition = 2 Temp. Attrition = 1	25
Posttest #3	n = 10 Attrition = 2	n = 11 Attrition = 3	21

Table 15.2 presents means on key pretest demographic variables, measures of child functioning, measures of family functioning, and degree of hearing loss on which attrition analyses were performed. As can be seen in Table 15.1, no attrition was experienced in the TC group by the time of the first posttest, but two subjects attrited from the Oral group by that time. Attrition analysis of the Oral group at the time of the first posttest indicated a significant difference between the attrited subjects and the active subjects in unaided hearing loss. The attrited subjects had statistically significantly greater hearing losses--the parents of whom felt a TC program was more appropriate than the Oral program. This difference was no longer evident at the second and third posttests, however. At the time of the second and third posttests, attrition appeared to have resulted in a significant group by attrition status interaction regarding percent of children in daycare more than 5 hours per day. These differences were not serious since it was likely they were due to random fluctuation and because this variable is not strongly related to the most critical outcome variables of this study. A statistically significant interaction was found at the second and third posttests on the pretest Communication Total score of the Battelle. The Communication score difference found on the second and third posttests attrition analysis represents that the attrited Oral subjects, who, for the most part, attrited because parents felt their child's level of hearing loss was too great to warrant an Oral program, performed considerably lower than the others in the study. It should also be noted that this subscale on the Battelle may be biased against hearing-impaired populations and that these results maybe due to the lack of reliability established with this population. Other than these minor differences, the groups remained quite comparable on key demographic variables, and measures of child and family functioning, despite attrition.

Demographic characteristics. Table 15.3 includes the analysis of pretest demographic characteristics with those that were included at each of the testings;

Table 15.2

Attrition Analysis on Pretest Measures and Demographics

	1st Posttest						2nd Posttest											
	Oral[*]						Oral						Total Communication					
	Attrited			Active			Attrited			Active			Attrited			Active		
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n
Age of child in months as of 7/1/86	39.0	(31.1)	2	37.1	(15.3)	14	37.5	(19.8)	4	37.3	(16.1)	12	31.6	(11.7)	3	39.8	(14.9)	13
Percent male	1.0	(0)	2	50%	(.52)	14	50%	(.57)	4	42%	(.52)	12	67%	(.57)	3	77%	(.44)	13
Percent with both parents living at home	50%	(7)	2	100%	(.39)	14	75%	(.50)	4	83%		12	100%		3	92%	(.27)	13
Total household income	$3,250	($5,303)	2	$18,321	($11,965)	14	$16,500	($5,339)	4	$18,083	($12,938)	12	$24,000	$(6,062)	3	$12,269	($6,360)	13
Percent of children in daycare more than 5 hours per week	0%		2	21.4%	(.43)	14	0%		4	25%	(.45)	12	100%		3	30.8%	(.48)	13
Months of prior preschool	22.5	(31.8)	2	8.1	(5.9)	14	3.0	(4.2)	4	9.0	(5.9)	12	3.0	(5.2)	3	9.0	(7.3)	13
DB loss left ear	107.5	(3.5)	2	84.7	(17.1)	14	94.8	(14.9)	4	85.3	(18.5)	12	100.0	(17.3)	3	86.6	(16.4)	13
DB loss right ear	105.0	(7.1)	2	83.4	(14.6)	14	94.8	(12.5)	4	83.3	(15.9)	12	83.3	(34.0)	3	86.5	(17.7)	12
BDI DQs[^]																		
Communication Total	21.6	(30.6)	2	47.1	(26.8)	14	22.2	(23.3)	4	51.1	(25.7)	12	49.9	(15.2)	3	32.9	(21.6)	13
BDI Total	70.6	(7.8)	2	77.0	(17.9)	14	72.3	(16.3)	4	77.5	(17.7)	12	76.0	(17.5)	3	72.5	(15.6)	13
Reynell Raw Score[*]																		
Receptive	46.0	(0.0)	1	28.7	(15.3)	12	16.0		1	29.9	(15.5)	11	25.0	(14.7)	3	27.4	(13.5)	13
Expressive	29.0	(0.0)	1	18.9	(15.1)	13	1.0		1	20.4	(14.8)	12	17.0	(10.8)	3	17.1	(12.1)	13
FACES III Total[#] (range 1 to 54)	12.8	(14.6)	2	8.7	(6.7)	14	12.4	(11.2)	4	8.2	(6.0)	12	4.1	(2.4)	3	7.4	(3.4)	13
PSI Total (range 137 to 328)	279.5	(67.2)	2	251.4	(30.9)	14	266.5	(42.6)	4	251.1	(33.3)	12	210.6	(26.6)	3	239.5	(41.5)	13

(continued)

[^] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[#] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[*] Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

[**] Attrition was experienced only in the oral group at the time of the first posttest, therefore analyses were conducted only in this group.

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Table 15.2 (continued)

Attrition Analysis on Pretest Measures and Demographics

	3rd Posttest											
	Oral						Total Communication					
	Attrited			Active			Attrited			Active		
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n
Age of child in months as of 7/1/86	39.0	(15.6)	6	36.4	(17.6)	10	35.0	(11.6)	5	39.7	(15.9)	11
Percent male	50%	(.55)	6	40%	(.52)	10	80%	(.45)	5	73%	(.47)	11
Percent with both parents living at home	67%	(.52)	6	90%	(.32)	10	80%	(.45)	5	100%		11
Total household income	$18,917	($14.551)	6	$16,950	($9,782)	10	$21,200	($9,391)	5	$11,409	($4,603)	11
Percent of children in care more than 5 hours per week	17%	(.41)	6	20%	(.42)	10	80%	(.45)	5	27%	(.47)	11
Months of prior preschool	3.5	(4.1)	6	10.0	(5.7)	10	6.2	(5.9)	5	8.6	(7.8)	11
DB loss left ear	91.8	(12.7)	6	85.1	(20.3)	10	94.4	(22.3)	5	86.7	(14.3)	11
DB loss right ear	92.3	(10.5)	6	82.4	(17.4)	10	84.4	(29.5)	5	86.6	(16.1)	10
BDI DQs[^]												
Communication Total	17.9	(19.8)	6	59.5	(18.2)	10	48.6	(18.4)	5	30.5	(20.7)	11
BDI Total	71.5	(13.3)	6	79.1	(18.9)	10	78.1	(17.5)	5	70.9	(14.7)	11
Reynell Raw Score[*]												
Receptive	19.7	(7.2)	3	31.8	(16.4)	9	26.2	(15.9)	5	27.3	(12.6)	11
Expressive	13.3	(12.0)	3	20.6	(16.1)	10	19.0	(13.9)	5	16.2	(10.9)	11
FACES III Total[#] (range 1 to 54)	11.5	(8.9)	6	7.9	(6.5)	10	5.3	(2.6)	5	7.4	(3.7)	11
PSI Total (range 137 to 328)	256.0		6	254.3	(35.3)	10	234.4	(37.6)	5	234.0	(42.9)	11

(continued)

[^] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[#] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[*] Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

pretest, first, second and third posttests. As can be seen, subjects were predominantly white, low middle class families in largely rural areas of Arkansas. While the groups included at each of the testings were fairly comparable, several differences were found. Of the 32 subjects included in the pretesting, the TC group had statistically significantly more males than the Oral group. This difference in gender ratio was evident only between the groups included in the pretest and between the groups included in the second posttest. Also evident between the groups included in the pretesting was a difference regarding the percentage of fathers employed as

Table 15.3

Comparability of Groups on Pretest Demographics Variables at the Arkansas Hearing Impaired Study

	Pretest Groups							1st Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
● Age of child in months as of 7/1/87	49.4	(16.4)	16	50.3	(14.5)	16	.87	49.1	(15.3)	14	50.3	(14.5)	16	.84
● Age of mother in years	30.6	(4.3)	16	30.5	(3.7)	16	.94	31.1	(4.3)	14	30.5	(3.7)	16	.69
● Age of father in years	33.5	(4.8)	15	32.4	(5.6)	16	.57	33.9	(4.7)	13	32.4	(5.6)	16	.45
● Percent male*	44%		16	75%		16	.07	50%		14	25%		16	.17
● Years of education for mother	12.4	(2.6)	16	11.3	(2.5)	16	.25	12.6	(2.7)	14	11.3	(2.5)	16	.17
● Years of education for father	13.3	(1.9)	15	11.4	(1.8)	16	.01	13.0	(1.8)	13	11.4	(1.8)	16	.03
● Percent with both parents living at home	81%		16	94%		16	.30	86%		14	94		16	.49
● Percent of children who are Caucasian*	80%		15	93		15	.30	79%		14	93		15	.27
● Hours per week mother employed	16.6	(18.1)	16	19.4	(20.1)	16	.68	18.0	(18.8)	14	19.4	(20.1	16	.85
● Hours per week father employed	45.4	(9.7)	13	39.0	(8.9)	16	.08	45.8	(9.9)	12	39.0	(8.9)	16	.07
● Percent of mothers employed as technical managerial or above*	19%		16	13%		16	.64	21%		14	13		16	.54
● Percent of fathers employed as technical managerial or above*	54%		13	13%		16	.02	50%		12	13%		16	.04
● Total household income^	$17,688	($11,556)	16	$14,469	($7,721)	16	.36	$18,321	($11,966)	14	$14,469	($7,721)	16	.31
● Percent with mother as primary caregiver*	88%		16	100%		16	.16	93%	(.3)	14	100%		16	.34
● Percent of children in in daycare more than 5 hours per day*	19%		16	44%		16	.14	21%		14	44%		16	.20
● Number of siblings	1.1	(1.1)	16	.8	(.6)	16	.31	1.0	(1.1)	14	.8	(.6)	16	.46
● Percent with English as primary language	93%		15	100%		16	.33	92%		13	100%		16	.34
● Months of prior preschool	9.1	(11.1)	16	7.8	(7.2)	16	.54	8.1	(5.90	14	7.8	(7.2)	16	.91

(continued)

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^ Means and standard deviations for this variable were estimated from categorical data.

Table 15.3 (continued)

Comparability of Groups on Pretest Demographics Variables at the Arkansas Hearing Impaired Study

	2nd Posttest Groups							3rd Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value
● Age of child in months as of 7/1/87	49.3	(16.1)	12	51.7	(14.9)	13	.69	48.4	(17.5)	10	51.8	(15.2)	12	.64
● Age of mother in years	31.4	(4.6)	12	29.8	(3.4)	13	.35	32.2	(4.5)	10	29.6	(3.7)	11	.16
● Age of father in years	33.9	(4.8)	11	32.1	(6.1)	13	.83	35.1	(4.4)	9	31.7	(6.5)	11	.19
● Percent male*	42%		12	77%		13	.08	60%		10	27%		11	.15
● Years of education for mother	12.5	(2.7)	12	10.8	(2.3)	13	.12	12.7	(2.6)	10	10.5	(2.4)	11	.07
● Years of education for father	13.2	(1.9)	11	11.3	(1.7)	13	.02	13.4	(2.1)	9	11.0	(1.7)	11	.01
● Percent with both parents living at home	83%		12	92%		13	.52	90%		10	100%		12	.34
● Percent of children who are Caucasian*	83%		12	92%		12	.56	100%		10	90%		11	.34
● Hours per week mother employed	18.5	(19.4)	12	17.7	(19.9)	13	.92	18.2	(19.2)	10	17.3	(19.9)	11	.92
● Hours per week father employed	44.0	(9.6)	10	38.7	(9.9)	13	.22	42.2	(8.3)	9	36.7	(8.4)	11	.16
● Percent of mothers employed as technical managerial or above*	8%		12	8%		13	.95	10%		10	8%		12	.89
● Percent of fathers employed as technical managerial or above*	50%		10	15%		13	.09	56%		9	8%		12	.03
● Total household income^	$18,085	($12,938)	12	$12,269	($6,359)	13	.18	$16,950	($9,782)	10	$11,809	($8,603)	11	.13
● Percent with mother as primary caregiver*	92%		12	100%		13	.34	90%		10	100%		12	.34
● Percent of children in in daycare more than 5 hours per day*	25%		12	31%		13	.76	20%		10	33%		12	.50
● Number of siblings	1.0	(1.1)	12	.8	(.6)	13	.54	1.0	(1.1)	10	.6	(.5)	11	.37
● Percent with English as primary language	91%		11	100%		13	.34	90%		10	100%		12	.34
● Months of prior preschool	9.0	(5.9)	12	9.0	(7.3)	13	1.00	10.0	(5.7)	10	7.9	(7.9)	12	.49

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* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^ Means and standard deviations for this variable were estimated from categorical data.

technical/managerial or above with the Oral group reporting a significantly higher percentage than the TC group. This difference was no longer evident in subsequent years. A difference was found between the subjects included in the pretest and those included in the first posttest on the number of hours fathers were employed; the Oral group reported a significantly greater number of hours than the TC group. This difference was not evident between the groups included in the second and third posttests. Another difference was found between the treatment group at each of the four testings regarding the years of education of the father. The Oral group reported significantly more years of education for the father than the TC group. This difference remained evident between the groups at each of the subsequent testings. Variables on which differences were found were considered for use as covariates in appropriate posttest analyses. Overall, however, the two groups were very comparable at pretest. Given the number of variables which were considered and the fact that the differences associated with developmental areas did not consistently favor one group, any slight differences between groups that were identified were likely the result of sampling fluctuation.

Intervention Programs

As indicated above, all children received half-day center-based services at least two days each week, and home intervention using the SKI*HI curriculum. Children in both groups received audiological services, appropriate hearing aids were selected, and training in their proper use was provided to teachers and parents.

Individualized Education Plans (IEPs) were written for each child at program entry, and at the end of each academic year. Audiological, speech and language, psychological, and other assessments (e.g., occupational and physical therapy) were completed and used in initial IEP development. The Texas Language Curriculum Roadmap was used during the school year as the basis for future IEP development and refinement. Audiological assessment was also conducted regularly, and comprehensive assessments, including all of the above components, were conducted every three years. For purposes of description, the intervention can be divided into those services which were center-based, and those that were home-based.

Center-based Program. Classroom activities were designed to promote expressive and receptive language skills of all children, including word usage and concept development. Teachers administered the Ling Articulation Index to assess children's Oral development and followed up with the Texas Language Curriculum for general programming guidelines. Objectives for IEPs were selected based on these instruments. A cognitively oriented approach to instruction that maximizes learning opportunities via structured and unstructured activities was used in the classroom. Structured activities were designed to match child interests and were presented via lesson plans that addressed specific objectives for each child. Using this child directed rather than teacher directed approach, activities could vary from the original plan if the children demonstrated interest in related but unanticipated areas. For example, in a travel activity that was designed to take place in a pretend car, if a child decided that his car had wings and could fly, the activity could be redirected toward air travel.

A typical schedule for a classroom day is presented below (all activities listed are in fact language activities, although only one is specifically called a "language activity):

9:00 - 9:20 AM: Group discussion of today's weather.

9:20 - 9:50 AM: Auditory training time. Children take turns listening to the teacher with their backs to her as she makes various sounds. The child listening raises her/his hand when the sound is heard.

9:50 - 10:10 AM: Free choice activity time. Children choose a play area in which they are interested (e.g. kitchen, chalk board, toy box), and interact with the teacher and other children in that setting.

10:10 - 10:30 AM: Snack time. Milk and cookies are provided, and children must vocalize or sign, as appropriate, to indicate what they want. Children are also given the opportunity to practice kitchen skills, such as pouring, measuring, etc.

10:30 - 11:00 AM: Language activity. Children will play "housekeeper" today, using naturally occurring opportunities to communicate their wants, needs, plans, and actions to the teacher and to each other.

11:00 - 11:30 AM: Gross motor activity. Children will play "leap frog" and "London Bridge" to develop both their motor skills and their listening/attending skills.

11:30 - 11:50 AM: Clean-up and plan time. Children will help clean the classroom by putting toys away, etc. Plans for tomorrow's activities will be discussed, and the children's comments will be used as appropriate to modify the teacher's plan.

11:50 - 12:00 PM: Prepare to leave and departure.

Home visits. The SKI*HI curriculum (Clark, 1985) was designed for use in the homes of hearing impaired preschoolers. It provided training for parents in management of a hearing impaired child, hearing aid care and maintenance, language development activities (using the same mode of communication used in the classroom), and child management. Home visits were conducted by the child's center-based teacher to ensure consistency and generalization from school to home. The home visitors monitored child development and progress as well as parent skills and needs to facilitate appropriate home programming. The equivalent of an IEP was developed for this purpose. Home visits were initially made three times a month, and tapered off as the family gained the skills and confidence to handle the daily concerns of their hearing impaired child, as well as the concerns of the family.

During the second and third years of the project, Oral and TC classes were conducted by each teacher on different days of the week or at different times of day, such that treatment groups were separated at all times and the same teacher provided service to both groups. Classroom dividers were used during the first year, and although groups were kept separate in this manner, the teachers suggested that children be taught at separate times to improve both the quality of their instruction and their ability to teach in the appropriate mode (i.e., Oral or TC).

Differences Between Oral and TC Programs. The Oral group was instructed using Oral intervention techniques including auditory training and development of Oral skills. Auditory training requires the child to respond to sound when the sound source is out of sight, as in the sample daily schedule below, and the Oral procedures require the child to vocalize all communications.

The TC group was trained using a comprehensive communication program that promotes the use of Oral/aural skills (by encouraging vocalization and using the same auditory training used with the Oral group) but encouraged the use of Signed Exact English II (SEE II) and other gestures as needed for communication. Parents in the TC group were trained in SEE II as part of their SKI-HI program and were encouraged to use sign language with their child.

Treatment Verification

A number of procedures were used to verify that treatment were implemented as intended. They are described below.

Collection of attendance data. The child's participation in the program was recorded according to the days of attendance at the center-based program. Attendance rates across the three years was comparable between the two groups (mean attendance for the oral group was 75.7% while the mean attendance for TC group was 78.6%).

Teacher evaluations. The preschool supervisor evaluated teachers on a 3 point scale (3 = criteria fully met; 2 = partially met; 1 = not met) that assessed the following: teacher assessment skills; IEP development skills; IEP implementation skills; presentation of instruction; and instructional environment. Average ratings by teacher were 3.0, 2.58, 2.9, 2.71, and 3.0. Additionally, teachers were ranked in quartiles (i.e., top 25%, top 50%, bottom 50%, and bottom 25%) relative to other teachers the supervisor has worked with. Two teachers were ranked in the top 25%, two in the top 50%, and one in the bottom 50%. Since teachers taught children in both groups, it is unlikely that the quality of teacher could have confounded the findings of the study with regard to Oral vs. TC. These data suggest that the preschool teachers at ASD were performing their duties as well as or better than other teachers in comparable settings.

Child health and additional services. Ratings of child's health were collected from each child's parent at the time of each testing and indicated no statistically significant differences on any in any of the health related areas. The two treatment groups were also comparable with respect to the amount of additional services received beyond that provide by the intervention program. The main areas in which additional services were provided were speech therapy (an overall mean of 45.6 hours during the year for all subjects in the study), and daycare (an overall mean of 213 hours during the year).

Site review. Formal site reviews were conducted in April, 1987, April, 1988, and March, 1989. While treatment differences were found to be adequate during the first year, the shift to alternating the times at which the groups were present for instruction had the desired impact of further emphasizing those differences. Specifically, teachers were less likely to use sign with the Oral group when that group was in class and the TC group was not. Dr. Roberto Gonzales of the University of Northern Colorado, an independent reviewer who viewed classroom videotapes from the 1987-1988 school year, reported that the quality of instruction for both groups was good and that clear communication mode differences were present and was the only difference between the groups.

Otherwise, the ASD program was judged to be in full or nearly full compliance with EIRI site review quality criteria. IEP development and lesson planning were good, with all IEP criteria being met or nearly met by all teachers. Teaching quality was found to be very good in both communication modes by the EIRI and ASD reviewers, as well as by the independent reviewer. Overall, the preschool program was considered to be of high quality as compared to other TC and oral/aural programs with similar philosophical orientations.

Use of communication mode at home. At the time of the third posttest, parents were asked about their use of communication modes at home. Out of the 9 children for whom data were collected in the Oral group, 7 spent the majority of their time away from school using Oral communication, although 4 of these reported using TC some of the time. Parents of 1 of the 9 children in the Oral group reported using TC the majority of the time, while 1 other parent reported using Oral half of the time and TC the other half.

Out of the 11 children in the TC group, 4 of the parents reported using TC the majority of the time, although 2 of these four reported using Oral some of the time. A total of 5 of the 11 children's parents reported that they used Oral and TC equally at home. Finally, 2 of the children in the TC group reported using Oral the majority of the time. It is not surprising that parents in the TC group relied on oral communication fairly frequently since sign language can often be difficult for most parents to learn.

Cost of alternative interventions. Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Because the only difference between groups in this study was the mode of communication used, between group cost differences were neither expected nor found. All costs were thus averaged across all children in the study. Total cost per child in 1990 dollars averaged $4,298 for school services only, and $6,413 when the cost of parent-provided time and transportation were included. Costs of direct service (teachers, aides, supervisor, and consultants) were or over 70% of the school services cost and 45% of the total cost with parent transportation. Parent transportation costs included both mileage and traveling time. Adjustments were made for parents who car-pooled. All cost data in Table 15.4 were adjusted for inflation to 1990 dollars. In addition, at the bottom of Table 15.4, the figures are discounted at 3% and 5%.

Data Collection

Data on all participants were collected at the time of group assignment and annually thereafter, as summarized below.

Recruitment, training, and monitoring of diagnosticians. Three local diagnosticians and an assessment supervisor were trained by EIRI staff to administer the standard pretest and posttest measures. Professors at local universities and professionals in local social service agencies were asked if they or others they knew

Table 15.4

Cost Per Child for Arkansas School for the Deaf (1990 Dollars)

Resources	Cost Per Child
1. **UNDISCOUNTED**	
Agency Costs	
Direct Service	$2,679
Administrative	312
Occupancy	880
Equipment	79
Travel	301
Materials/Supplies	19
Miscellaneous	28
SUBTOTAL	**$4,298**
Contributed Resources	
Parent Time	126
Child Transportation	2,067
Equipment	22
SUBTOTAL	**$2,215**
TOTAL	***$6,513***
2. **DISCOUNTED (3%)**	
Subtotal	$4,695
• Total	7,115
3. **DISCOUNTED (5%)**	
Subtotal	$4,974
Total	7,537

* *Totals may not add up due to rounding errors.*

were willing to do testing. One graduate student and three professionals at a local rehabilitation program were trained in administration of the Battelle Developmental Inventory (BDI). The most experienced professional was identified as an assessment coordinator. All diagnosticians viewed videotapes of administration procedures for the Battelle Developmental Inventory (BDI), reviewed the BDI administration manual, and completed a self-test of BDI procedures before attending a two-day training session. The training session addressed all facets of the BDI, and included a competency test. Finally, persons who completed the training completed three practice tests, one of which was both shadow scored and videotaped by the coordinator. The videotape was sent to EIRI for review, and an interrater agreement of .85 was required before certification as a diagnostician.

The supervisor and two of the diagnosticians held Ph.D.s and the other had a master's degree. Student diagnosticians who administered the complementary measures were selected by the faculty of the Department of Speech and Language Pathology at the University of Central Arkansas (UCA) based on completion of a specified set of courses in speech pathology. All diagnosticians were proficient in sign language. Student testers from UCA were trained in sign language and had access to the teacher during testing, such that optimal communication with the child was maintained. Each diagnostician test approximately the same number of children in each group. Testing was scheduled by the local coordinator in cooperation with the assessment supervisor, who shadow scored 10% of the test administrations. Shadow scored tests indicated an average of 93.3% agreement, with a range of 91% to 96%. Agreement was calculated by dividing the number of exact agreements in scoring items administered by the total number of items administered. Exact agreement meant that both raters scored an item '0,' '1,' or '2.'

Pretest. The pretest battery consisting of the Battelle Developmental Inventory (BDI), the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES) was administered to 32 children and families. Families were given a $20 incentive for their participation in pretesting. Testing was conducted by one of the diagnosticians, each of whom is a fluent signer and unaware of the child's group assignment. Mode of administration for the BDI (i.e., Oral vs. TC) was determined by the examiner after a period of interaction with the child and family, and was noted on the test protocol. Testing occurred in rooms provided at the preschool site where the child attended class. Mothers completed the family measures following administration of the BDI, and fathers (when possible) completed the Family Support Scale only. If the father or other male was present in the home but was not at the testing session, the parent was given a copy of the Family Support Scale to take home for him/her to complete. The diagnosticians completed testing reports and transmitted all data to the assessment supervisor, who checked the scoring accuracy and forwarded the protocols to EIRI via certified mail.

Posttest #1. The first round of posttesting occurred during April and May, 1987 for children enrolled during the 1986-87 academic year, and in April and May, 1988 for those who were not enrolled until the 1987-88 academic year, allowing five to six months of intervention between pre- and posttesting. The posttest battery was administered in two sessions, as described below.

The first session was conducted by graduate practicum students from the department of speech pathology at the University of Central Arkansas (UCA). Tests administered at this time were the Receptive and Expressive Language sections of the Reynell Developmental Language Scales. Each of these measures was administered by the same student to all children. That is, one student did all the Reynell Receptives, another all the Reynell Expressives, etc. Because of the nature of these tests and the experimental comparison (Oral vs. TC), these diagnosticians knew the mode of communication used by the child, but were unaware of the purpose of the study. Tests were administered in the mode appropriate to the child's group. The graduate students were supervised by faculty from UCA.

The second session was administered by the same set of naive diagnosticians, but not necessarily the same diagnostician, who administered the pretests. In addition to the instruments used at pretest, mothers completed the Parent Survey Form, the Parent Report of Child's Health, the Additional Services Form, and the

Parent Satisfaction with Services Form, and teachers completed the Meadow-Kendall on each child in their classroom. Parents were paid a $30 incentive for testing.

Posttest #2. The second round of posttest data collection was conducted from April through June, 1988. The procedures used and measures included were the same as those employed in the first posttest session.

Posttest #3. Posttest #3 included all of the measures used in Posttest #2 with the additional of a parent survey intended to elicit attitudes about their child's experience in the intervention program. Additionally, a measure was used to determine the extent to which children were using their assigned mode of communication outside of intervention and to determine parents attitudes toward the communication mode being used. The latter addition included a semantic attitude checklist developed by the project on which parents indicated how much of the time their communication with their child was, for example, "productive". Other words on which parent were asked to rate their communication included, for example: frustrating, rewarding, confusing, comfortable, relaxed, business-like, interactive, fun, natural, etc.

Results and Discussion

The following section will present the results of the study with respect to the following research questions:

1. To what extent are the two treatment groups comparable on pretest measures of child and parent functioning?
2. To what extent are there differences between the two treatment groups on measures of child functioning at the first, second, and third posttests?
3. To what extent are there differences between the two treatment groups on measures of family functioning at the first, second, and third posttests?
4. What is the relationship between the costs and effects of each treatment?

Comparability of Groups at Pretest

Pretest results from the measures of child functioning are summarized in Table 15.5 and includes the analysis of pretest scores for subjects that were included at each of the testings; pretest, first, second and third posttests. As can be seen, the two treatment groups demonstrated comparable abilities on the pretest measures of child functioning. While it is possible that attrition would have caused the comparability of the groups to be negatively changed across the subsequent three years of the study, this was not the case until the third posttest. The attrition

Table 15.5

Comparability of Groups on Pretest Measures

	Pretest Groups							1st Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value
● Age of child in months as of 7/1/86	37.4	(16.4)	16	38.3	(14.5)	16	.87	37.1	(15.3)	14	38.3	(14.5)	16	.84
● Battelle Developmental Inventory (BDI)														
Personal/Social	88.4	(32.1)	16	87.3	(26.8)	16	.70	88.3	(34.1)	14	87.3	(26.8)	16	.67
Adaptive Behavior	87.8	(19.6)	16	84.3	(17.9)	16	.94	89.1	(20.6)	14	84.3	(17.9)	16	.85
Gross Motor	89.9	(21.6)	16	81.9	(21.5)	16	.85	89.1	(22.6)	14	81.9	(21.5)	16	.92
Fine Motor	93.6	(15.8)	16	89.2	(15.0)	16	.96	91.8	(16.1)	14	89.2	(15.0)	16	.87
Motor Total	90.2	(16.0)	16	83.7	(17.1)	16	.90	89.2	(16.7)	14	83.7	(17.1)	16	.98
Expressive Comm.	46.9	(27.6)	16	38.2	(21.4)	16	.78	49.9	(27.1)	14	38.2	(21.4)	16	.70
Receptive Com,.	41.8	(27.9)	16	35.3	(24.1)	16	.67	44.9	(27.4)	14	35.3	(24.1)	16	.53
Communication Total	43.9	(27.6)	16	36.2	(21.2)	16	.72	47.1	(26.8)	14	36.2	(21.2)	16	.61
Cognitive	69.6	(24.5)	16	70.3	(19.1)	16	.85	71.6	(25.6)	14	70.3	(19.1)	16	.87
TOTAL	76.2	(16.9)	16	73.2	(15.4)	16	.96	77.0	(17.9)	14	73.2	(15.4)	16	.96
● Raynell Raw Score														
Receptive	30.1	(15.4)	13	26.9	(13.2)	16	.56	28.8	(15.3)	12	26.9	(13.2)	16	.74
Expressive	19.6	(14.7)	14	17.1	(11.5)	16	.59	18.9	(15.1)	13	17.1	(11.5)	16	.71
DB loss left ear	87.6	(17.7)	16	89.1	(16.8)	16	.81	84.7	(17.1)	14	89.1	(16.8)	16	.49
DB loss right ear	86.1	(15.6)	16	85.8	(20.4)	16	.97	83.4	(14.6)	14	85.8	(20.4)	15	.72
DB loss w/hearing aid	40.1	(17.2)	15	48.6	(17.4)	13	.20	35.8	(13.2)	13	48.6	(17.4)	13	.05
	2nd Posttest Groups							3rd Posttest Groups						
● Age of child in months as of 7/1/86	37.3	(16.1)	12	39.8	(14.9)	13	.69	36.4	(17.5)	10	39.8	(15.2)	12	.64
● Battelle Developmental Inventory (BDI)														
Personal/Social	88.0	(35.2)	12	86.1	(29.1)	13	.69	87.3	(38.8)	10	84.9	(29.5)	11	.63
Adaptive Behavior	88.1	(21.3)	12	84.0	(19.4)	13	.96	86.1	(22.9)	10	83.0	(20.9)	11	.94
Gross Motor	90.6	(23.8)	12	82.0	(22.3)	13	.94	89.4	(22.2)	10	80.5	(22.1)	11	.96
Fine Motor	92.1	(15.9)	12	90.4	(16.5)	13	.83	91.6	(17.1)	10	89.8	(17.9)	11	.83
Motor Total	90.1	(17.2)	12	85.5	(16.0)	13	.96	89.1	(17.1)	10	84.6	(16.6)	11	.95
Expressive Comm.	53.5	(26.1)	12	36.1	(23.1)	13	.47	60.3	(22.7)	10	31.2	(19.7)	11	.10
Receptive Comm.	49.8	(26.5)	12	30.8	(21.9)	13	.28	58.9	(17.2)	10	31.8	(21.1)	11	.08
Communication Total	51.1	(25.7)	12	32.9	(21.6)	13	.37	59.5	(18.2)	10	30.5	(20.7)	11	.08
Cognitive	71.6	(26.7)	12	71.2	(20.5)	13	.85	76.9	(25.2)	10	68.5	(18.9)	11	.63
TOTAL	77.5	(17.7)	12	72.5	(15.6)	13	.99	79.1	(18.9)	10	70.9	(14.7)	11	.86
● Raynell Raw Score														
Receptive	29.9	(15.5)	11	27.4	(13.5)	13	.67	31.8	(16.4)	9	27.8	(12.2)	12	.53
Expressive	20.4	(14.7)	12	17.1	(12.1)	13	.54	20.6	(16.1)	10	17.0	(10.8)	12	.54
DB loss left ear	85.3	(18.5)	12	86.6	(16.4)	13	.85	85.1	(20.3)	10	86.2	(13.8)	12	.88
DB loss right ear	83.3	(15.9)	12	86.5	(17.8)	12	.64	82.4	(17.4)	10	87.4	(15.5)	11	.49
DB loss w/hearing aid	38.4	(9.8)	12	46.5	(18.1)	11	.19	38.9	(9.9)	10	49.1	(18.6)	11	.14

which had accrued by the time of the third test resulted in a statistically significant pretest difference between the groups in the communication domain of the Battelle--the Oral group scoring significantly higher than the TC group. Thus, the communication domain score on the Battelle was used as covariate in third posttest analysis.

Regarding the measures of family functioning, the groups appeared to be fairly comparable on pretest measures over the course of the four testings (see Table 15.6). The "other-related" score on the PSI was also identified as covariate to be used in posttest analyses, since a statistically significant difference was found between the groups in each year's analysis. Additionally, a statistically significant difference (p = .09) was found on the FILE at pretest in favor of the TC group.

Posttest Measures of Child Functioning

Table 15.7 summarizes the results of posttest analyses on the measures of child functioning. As can be seen, no statistically significant differences were found on the Battelle at the first, second, or third posttests with exception of a small difference found at the third posttest on the Fine Motor domain. No differences were found on the Reynell at any of the posttests indicating that neither mode of communication used as a part of early intervention was superior with regard to its effect on receptive and/or expressive language development. Further, no significant differences were found on the main scales of the Meadow-Kendall at any of the posttests with the exception of a difference on the sociable, communicative behavior scales at the second posttest. In this case, the Total Communication group scored significantly higher than the oral group suggesting, perhaps, that the children in this group had greater early success in communicating socially and that the use of total communication had facilitated this behavior more so than did the oral

Table 15.6

Comparability of Groups of Pretest Measures

	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	x̄	(SD)	n	x̄	(SD)	n	P Value	x̄	(SD)	n	x̄	(SD)	n	P Value
	Children Participating in Pretest							**Children Participating in Posttest #1**						
● Parenting Stress Index (PSI) Percentile Rank														
Total (range 137 to 328)	254.9	(35.0)	16	234.1	(40.1)	16	.13	251.4	(30.9)	14	234.1	(40.1)	16	.19
Child Related (range 50 to 235)	114.6	(17.7)	16	111.3	(23.2)	16	.65	110.9	(12.3)	14	111.3	(23.2)	16	.95
Other Related (range 74 to 200)	140.3	(27.8)	16	122.8	(19.5)	16	.05	140.5	(28.4)	14	122.8	(19.5)	16	.06
● Family Support Scale (FSS)	26.0	(10.8)	16	27.2	(8.4)	16	.73	25.0	(10.6)	14	27.2	(8.4)	14	.55
● Family Resource Scale (FRS)	118.8	(23.8)	16	122.9	(18.1)	16	.59	122.4	(22.8)	14	122.9	(18.1)	16	.95
● Family Index of Life Events (FILE)	12.0	(6.8)	16	8.3	(5.5)	16	.09	11.1	(6.1)	14	8.3	(5.5)	16	.19
● Family Adaptation and Cohesion Evaluation Scales (FACES III)														
Cohesion (range 0 to 30)	6.2	(7.5)	16	3.6	(3.0)	16	.22	5.5	(6.8)	14	3.6	(3.0)	16	.37
Adaptation (range 0 to 24)	5.3	(4.3)	16	4.6	(3.8)	16	.66	5.3	(4.3)	14	4.7	(3.8)	16	.69
TOTAL (range 1 to 54)	9.2	(7.4)	16	6.8	(3.5)	16	.24	8.7	(6.7)	14	6.8	(3.5)	16	.34
	Children Participating in Posttest #2							**Children Participating in Posttest #3**						
● Parenting Stress Index (PSI) Percentile Rank														
Total (range 137 to 328)	251.1	(33.3)	12	239.5	(41.5)	13	.45	254.3	(35.3)	10	229.8	(43.5)	12	.16
Child Related (range 50 to 235)	109.6	(12.8)	12	114.7	(23.7)	13	.50	110.3	(13.9)	10	109.5	(24.6)	12	.93
Other Related (range 74 to 200)	141.5	(30.5)	12	124.7	(20.4)	13	.13	144.0	(32.3)	10	120.3	(21.6)	12	.06
● Family Support Scale (FSS)	24.3	(10.8)	12	25.1	(4.9)	11	.83	23.3	(11.3)	10	26.7	(9.8)	10	.48
● Family Resource Scale (FRS)	124.6	(23.6)	12	121.6	(19.7)	13	.73	126.2	(23.9)	10	123.1	(19.9)	12	.75
● Family Index of Life Events (FILE)	9.9	(5.8)	12	9.2	(5.7)	13	.74	10.7	(6.1)	10	7.6	(3.5)	12	.17
● Family Adaptation and Cohesion Evaluation Scales (FACES III)														
Cohesion (range 0 to 30)	4.5	(5.6)	12	3.8	(3.2)	13	.73	5.0	(6.1)	10	3.8	(3.4)	12	.59
Adaptation (range 0 to 24)	5.7	(4.4)	12	5.3	(3.8)	13	.78	4.9	(4.3)	10	4.8	(4.2)	12	.93
TOTAL (range 1 to 54)	8.2	(6.0)	12	7.4	(3.4)	13	.68	7.8	(6.5)	10	7.2	(3.6)	12	.79

Table 15.7

Summary of ANCOVA's on Measures of Child Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
POSTTEST #1												
Age of Child at time of test		48.0	(14.6)		14	49.6	(13.9)		16	.10	.76	.11
BDI +												
Personal/Social DQ	5,6,10,11	82.4	(26.2)	77.8	12	70.6	(19.9)	75.2	16	.04	.84	-.06
Adaptive Behavior DQ	5,6,10,11	85.6	(21.1)	82.5	12	79.3	(17.4)	83.4	16	.12	.73	.05
Gross Motor DQ	5,6,10,11	82.5	(17.4)	80.8	12	83.9	(24.1)	85.6	16	.03	.86	.23
Fine Motor DQ	5,6,10,11	91.5	(13.5)	88.7	12	86.1	(14.6)	88.8	16	.25	.62	.01
Motor Total DQ	5,6,10,11	86.2	(14.6)	83.8	12	84.7	(15.7)	87.2	16	.01	.90	.22
Expressive Comm. DQ	5,6,10,11	51.7	(16.9)	48.2	12	44.1	(17.7)	47.6	16	.01	.94	-.03
Receptive Comm. DQ	5,6,10,11	50.7	(20.7)	49.7	12	41.4	(15.9)	42.4	16	.28	.60	-.41
Communication Total DQ	5,6,10,11	50.6	(16.6)	47.9	12	42.8	(17.2)	45.4	16	.03	.87	-.15
Cognitive Total DQ	5,6,10,11	66.7	(18.1)	62.6	12	63.1	(16.4)	67.2	16	.07	.79	.27
BDI Total DQ	5,6,10,11	73.8	(14.7)	69.9	12	67.1	(13.5)	71.0	16	.01	.91	.08
Reynell Raw Score												
Receptive	1,2	28.7	(15.3)	28.8	12	26.9	(13.2)	26.8	16	.17	.68	-.14
Expressive	3	18.9	(15.1)	17.7	13	17.1	(11.5)	18.3	16	.01	.90	.05
Meadow-Kendall												
Sociable/Comm. Behavior	4,5	342.6	(55.5)	339.2	13	335.6	(41.5)	339.0	16	.00	.99	.00
Impulsive Behavior	6,7	305.5	(57.5)	298.8	13	297.3	(57.3)	308.8	16	.06	.81	.17
Developmental Lags	8	345.7	(43.9)	341.0	13	325.9	(59.7)	330.5	16	.27	.61	-.20
Anxious Compulsive Beh.	6,9	311.6	(55.5)	314.3	13	330.9	(48.4)	328.2	16	.48	.49	.27
POSTTEST #2												
Age of Child at time of test		63.5	(11.2)		11	62.4	(13.4)		13			-.09
BDI +												
Personal/Social DQ	3,6,10,11	81.8	(17.6)	78.2	10	78.9	(21.1)	82.6	13	.24	.63	.22
Adaptive Behavior DQ	3,6,10,11	88.7	(14.1)	82.6	10	77.6	(19.9)	83.7	13	.09	.77	.06
Gross Motor DQ	3,6,10,11	86.8	(18.7)	81.4	10	80.6	(28.0)	86.1	13	.07	.79	.20
Fine Motor DQ	3,6,10,11	93.9	(9.4)	87.6	10	86.2	(22.1)	92.7	13	.16	.69	.31
Motor Total DQ	3,6,10,11	90.4	(9.5)	84.8	10	83.2	(22.2)	88.8	13	.33	.57	.24
Expressive Comm. DQ	3,6,10,11	47.3	(14.6)	42.9	10	39.3	(13.1)	43.6	13	.18	.68	.05
Receptive Comm. DQ	3,6,10,11	50.7	(16.5)	47.1	10	37.0	(15.2)	40.6	13	1.27	.27	-.41
Communication Total DQ	3,6,10,11	48.5	(13.9)	44.5	10	38.6	(12.8)	42.6	13	.60	.45	-.14
Cognitive Total DQ	3,6,10,11	74.1	(19.8)	66.4	10	64.5	(18.1)	72.2	13	.01	.93	.31
BDI Total DQ	3,6,10,11	75.3	(11.3)	69.9	10	67.4	(16.4)	72.8	13	.28	.60	.20
Reynell Raw Score												
Receptive	1,2	34.1	(12.5)	32.6	11	32.7	(15.1)	34.2	13	.09	.76	.11
Expressive	1,2,3	38.5	(15.4)	34.6	10	32.7	(13.5)	36.6	13	.10	.75	.14
Meadow-Kendall												
Sociable/Comm. Behavior	4,5,6	314.8	(58.2)	311.0	11	345.0	(25.3)	348.8	13	5.91	.03	.94
Impulsive Behavior	7	307.5	(45.6)	307.5	11	323.9	(40.1)	323.9	11	.82	.37	.38
Developmental Lags	6,8,2	361.4	(28.5)	360.4	11	358.2	(32.8)	359.2	13	.01	.92	-.04
Anxious Compulsive Beh.	9	340.5	(69.8)	330.5	11	348.6	(40.0)	358.6	13	1.55	.23	.52

(continued)

* Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

+ Developmental Quotient (DQ) were calcualted by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

^ $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

Table 15.7 (continued)

Summary of ANCOVA's on Measures of Child Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
POSTTEST #3												
Age of Child at time of test		72.4	(17.5)		10	75.1	(11.5)		12	.19	.67	.19
BDI +												
Personal/Social DQ	9,10,11,12	90.9	(12.1)	82.0	8	77.3	(19.9)	86.3	11	2.99	.11	.26
Adaptive Behavior DQ	9,10,11,12	91.6	(12.1)	81.0	8	77.9	(25.2)	88.6	11	1.05	.33	.38
Gross Motor DQ	9,10,11,12	97.8	(16.9)	87.6	8	81.9	(27.2)	92.1	11	.84	.37	.20
Fine Motor DQ	9,10,11,12	91.7	(12.1)	81.5	8	94.7	(31.5)	104.9	11	3.32	.09	1.00
Motor Total DQ	9,10,11,12	92.7	(12.5)	81.7	8	87.3	(25.6)	98.2	11	2.11	.17	.82
Expressive Comm. DQ	9,10,11,12	59.9	(25.9)	56.6	8	39.5	(14.5)	42.8	11	.38	.55	-.72
Receptive Comm. DQ	9,10,11,12	58.3	(24.1)	54.7	8	41.6	(15.7)	45.1	11	.09	.74	-.50
Communication Total DQ	9,10,11,12	57.6	(22.0)	54.0	8	40.4	(14.5)	44.0	11	.23	.64	-.57
Cognitive Total DQ	9,10,11,12	73.9	(22.9)	63.8	8	62.8	(14.3)	72.9	11	.27	.61	.51
BDI Total DQ	9,10,11,12	80.0	(12.9)	72.2	8	67.1	(17.3)	74.9	11	.70	.42	.17
Reynell Raw Score												
Receptive	1,2	40.6	(15.3)	41.1	9	44.6	(7.9)	44.1	10	.27	.61	.26
Expressive	3,4,5	43.5	(16.9)	34.3	8	33.3	(12.0)	42.5	10	.76	.40	.58
Meadow-Kendall												
Sociable/Comm. Behavior	6,7	352.5	(33.9)	351.8	9	352.4	(29.2)	353.1	11	.01	.92	.04
Impulsive Behavior	8	322.3	(40.5)	324.3	9	325.9	(50.8	323.9	11	.00	.98	.01
Developmental Lags	9,4	374.1	(27.8)	372.2	9	368.1	(36.8)	370.0	11	.02	.88	-.07
Anxious Compulsive Beh.	3	334.5	(53.2)	321.1	8	334.8	(31.9)	348.2	11	1.80	.19	.67

* Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

+ Developmental Quotient (DQ) were calcualted by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

^ $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

communication mode. It is more likely, however, that these differences were due to random fluctuation in light of the relatively large number of measures examined.

Posttest Measures of Family Functioning

Table 15.8 summarizes the results of posttest analyses on the measures of family functioning. As can be noticed, no statistically significant differences were found on any of the measures of family functioning at any of the three posttests with the exception of a difference found on the second posttest FACES III total scores. In this case, the TC group, although not significantly less healthy than the oral group on either of the subscales, scored statistically significantly less healthy than the Oral group on the total score. Given the large number of

Table 15.8

Summary of ANCOVA's on Measures of Family Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
POSTTEST #1												
Parenting Stress Index												
Child Related (range 50 to 235)	1	112.9	(13.9)	111.4	13	111.3	(15.5)	112.7	16	.05	.89	-.09
Other Realted (range 74 to 200)	1	126.6	(21.6)	124.6	13	123.8	(17.9)	25.8	16	.03	.87	-.06
Total (range 137 to 328)	1	239.5	(33.6)	236.0	13	235.1	(28.1)	238.5	16	.05	.83	-.08
FACES III**												
Adaptation (range 0 to 24)	2,3,4	3.8	(3.8)	3.7	13	6.5	(3.5)	6.6	16	3.67	.07	-.80
Cohesion (range 0 to 30)	2,5,6	4.2	(2.8)	4.3	14	3.9	(3.1)	3.8	16	.14	.71	.17
Total (range 1 to 54)	7	6.5	(3.3)	6.4	14	8.2	(3.5)	8.2	16	2.29	.14	-.53
Family Resource Scale& (FRS)	6	112.9	(27.2)	113.4	14	122.6	(10.3)	122.1	16	1.28	.27	.48
Family Support Scale& (FSS)	2,6,8	31.0	(10.9)	30.5	14	26.6	(6.7)	27.1	14	1.82	.19	-.39
POSTTEST #2												
Parenting Stress Index												
Child Related (range 50 to 235)	1	112.1	(9.5)	111.7	11	112.0	(9.7)	112.4	12	.05	.83	-.07
Other Realted (range 74 to 200)	1	130.6	(22.8)	130.1	11	128.0	(22.8)	128.5	12	.03	.86	.07
Total (range 137 to 328)	1	242.7	(27.6)	241.8	11	240.0	(30.3)	240.9	12	.01	.94	.03
FACES III**												
Adaptation (range 0 to 24)	2,3,4	4.6	(3.3)	5.8	11	8.2	(3.5)	6.9	12	.74	.40	-.32
Cohesion (range 0 to 30)	2,5	3.3	(2.0)	3.3	12	4.0	(2.8)	4.0	12	.45	.51	-.29
Total (range 1 to 54)	2,6	6.2	(2.8)	6.4	12	9.4	(3.8)	9.2	12	5.33	.03	-.85
Family Resource Scale& (FRS)	7	119.3	(17.5)	118.9	12	119.5	(14.1)	119.8	12	.02	.88	.06
Family Support Scale& (FSS)	2,8,9	26.1	(13.3)	25.5	12	20.8	(9.8)	21.3	10	1.06	.32	-.36

(continued)

* Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

^ $$\text{ES} = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

** Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicated the distance from "ideal" in raw score units. A score of "0" is best.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Table 15.8 (continued)

Summary of ANCOVA's on Measures of Family Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates[*]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES[^]
POSTTEST #3												
Parenting Stress Index												
Child Related (range 50 to 235)	1	111.5	(15.6)	109.3	9	104.3	(20.9)	106.6	11	.11	.74	.15
Other Realted (range 74 to 200)	1	134.6	(24.9)	133.5	9	122.7	(24.9)	123.9	11	.65	.43	.39
Total (range 137 to 328)	1	246.2	(35.4)	242.7	9	227.0	(41.8)	230.5	11	.48	.49	.31
FACES III[**]												
Adaptation (range 0 to 24)	2,3,4	6.5	(3.8)	7.5	8	7.3	(4.8)	6.3	11	.27	.61	.27
Cohesion (range 0 to 30)	2,5	3.4	(2.7)	3.9	8	5.4	(2.6)	4.8	11	.46	.51	-.34
Total (range 1 to 54)	2,3,4	7.8	(3.6)	8.7	8	9.7	(3.8)	8.8	11	.00	.97	-.03
Family Resource Scale[&] (FRS)	6,7	113.5	(17.1)	116.5	9	121.0	(21.8)	118.0	10	.02	.89	.08
Family Support Scale[&] (FSS)	8,7	25.4	(9.4)	24.7	9	22.7	(6.3)	23.5	9	.11	.75	-.15

[*] Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education: 11 = Hours Father Worked/week.

[^] $$\text{ES} = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

[**] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicated the distance from "ideal" in raw score units. A score of "0" is best.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

variables tested and the fact that the average effect size across all measures was so close to zero, this difference is likely due random fluctuation.

Results of the parent satisfaction questionnaire are presented in Table 15.9. These findings indicate several statistically significant differences at the time of the first posttest, each of which suggests that the parents in the Oral group were more satisfied than the parents in the TC group. These differences were no longer noticeable in subsequent year, although there was a minor difference on the variable, "Satisfaction with staff who work with the child." Again, the parents in the Oral group reported being statistically significantly more satisfied than the

Table 15.9

Summary of Parent Satisfaction Questionnaire For the Arkansas Hearing Impaired Study

	Oral Communication			Total Communication			ANCOVA		
Variable*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p Value	ES^
POSTTEST #1									
Satisfaction w/staff who work with children	3.9	(.27)	14	3.4	(.51)	16	10.36	.00	1.26
Satisfaction w/ability to to communicate w/program staff	3.8	(.36)	14	3.2	(.40)	16	22.58	.00	-1.74
Satisfaction w/program goals developed for child	3.6	(.49)	14	3.4	(.50)	16	2.15	.15	-.55
Satisfaction with opportunities to participate in child's program	3.6	(.49)	14	3.3	(.45)	16	5.19	.03	-.83
Satisfaction w/rage of services available for child	3.5	(.52)	13	3.0	(.63)	16	6.08	.02	-.93
Satisfaction w/progress child made	3.7	(.48)	13	3.4	(.51)	16	1.87	.18	-.51
POSTTEST #2									
Satisfaction w/staff who work with children	3.7	(.47)	11	3.4	(.51)	11	3.05	.09	-.75
Satisfaction w/ability to to communicate w/program staff	3.6	(.51)	11	3.5	(.52)	11	.17	.68	-.17
Satisfaction w/program goals developed for child	3.3	(.47)	11	3.3	(.47)	11	.19	.66	-.18
Satisfaction with opportunities to participate in child's program	3.2	(.60)	11	3.4	(.51)	11	.59	.45	.33
Satisfaction w/range of services available for child	3.0	(.78)	11	3.3	(.47)	11	1.0	.33	.44
Satisfaction w/progress child made	3.5	(.52)	11	3.7	(.47)	11	.74	.40	.38

(continued)

* Parent satisfaction means are based on a four point scale on which high scores are most positive.

^ $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

Table 15.9 (continued)

Summary of Parent Satisfaction Questionnaire
For the Arkansas Hearing Impaired Study

	Oral Communication			Total Communication			ANCOVA		
Variable*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p Value	ES^
POSTTEST #3									
Satisfaction w/staff who work with children	3.5	(.73)	9	3.7	(.47)	11	.41	.53	.01
Satisfaction w/ability to to communicate w/program staff	3.7	(.50)	9	3.3	(.91)	11	1.36	.26	-.55
Satisfaction w/program goals developed for child	3.5	(.53)	9	3.5	(.69)	11	.00	.97	.02
Satisfaction with opportunities to participate in child's program	3.4	(.73)	9	2.9	(.83)	11	2.29	.15	-.68
Satisfaction w/range of services available for child	3.2	(.67)	9	3.0	(.63)	11	.58	.45	-.34
Satisfaction w/progress child made	3.3	(.71)	9	3.6	(.67)	11	.96	.34	.45

* Parent satisfaction means are based on a four point scale on which high scores are most positive.

^ $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communciation Adj.}\bar{x}}{\text{Pooled SD}}$$

parents in the TC group. Otherwise, parents in the two groups reported remaining quite satisfied with their child's services throughout the three years of the project.

Parents in each group were asked to depict the nature of their communication with their child in terms of a semantic attitude checklist. The results of this analysis indicated that the fathers in the TC group perceived their communication with their child more positively than did the fathers in the Oral group (F=5.05, p= .05). Although not statistically significantly higher, the TC mothers' perceptions of their communication with their child were slightly more positive than the Oral mothers (F = 1.45, p = .25).

Conclusions

When posed with the issue of the most appropriate mode of communication to be used in early intervention, educators and experienced parents, often have fairly firm criteria for determining what types of children and families should receive intervention in what communication mode. Identifying specific child and families characteristics which are most conducive to a particular mode of communication would require a very large group study under which alternative interventions were carefully controlled. Such a large group study on a low incidence handicapping condition, such as hearing impairments, is difficult to accomplish. This study, though not including large enough groups to warrant extensive analysis by specific child and family characteristics, indicated that when children and families from a variety of backgrounds, socioeconomic status, and familiarity with deafness were randomly assigned to a mode of communication for use in high-quality early intervention programs, no statistically significant differences were found in terms of general child development (as measured by the Battelle) or on any of the other measures of child functioning which closely examined communication skills. Further, few differences were found on measures of family stress, adaptability and cohesion.

These findings suggest that the key to effective early intervention with hearing impaired children may not be the mode of communication which is used, but is likely to be found in other variables effecting the quality of intervention such as the level of training and experience of the teacher, teacher-pupil ratio, parent involvement, and any number of other variables which may be contributing. Future research should, therefore, be focused on determining the effects of these variables on early intervention with hearing impaired children and their families with the intent of refining the criteria for best early intervention practices with this population.

PROJECT PITCH

Project #16

COMPARISON: Moderately speech disordered, 3 and 4 year olds, home parent training speech therapy services versus clinic-based speech therapy services.

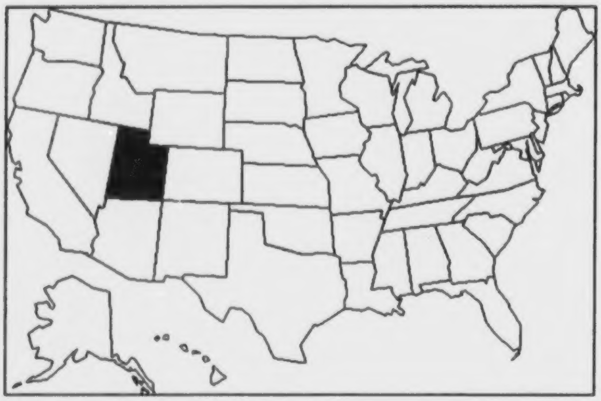
LOCAL CONTACT PERSON: Bunny McCoun, Speech Therapist, Project PITCH

EIRI COORDINATOR: William Eiserman

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 10-9-89

Rationale for Study



P.L. 99-457 mandates parental involvement in early intervention. The question of how to most appropriately involve parents, however, remains a topic of much discussion and introspection by those in the field. A common approach to fulfilling the mandate is to involve parents rather minimally by offering a monthly parent support group or some other informal mechanism for keeping parents informed about their child's progress and ways they might contribute. In other programs, however, parents are more intensively trained to work directly with the child and are given the responsibility to provide the primary, direct service intervention (Weiner & Koppelman, 1987)

One area in which parents have reportedly been quite successful in providing primary direct services to their special needs child is early intervention with speech disordered children (Barnett et al., 1988; McCoun, 1988). Programs in which parents have been involved very minimally, however, have also demonstrated success

(Karnes, Hodgins, Stoneburner, Studley, & Teska, 1968). Unfortunately, studies evaluating the effects of both approaches are fraught with methodological weaknesses; furthermore, varying degrees of parental involvement have seldom been compared systematically (Gatling & White, 1987; Reeder, Casto, & Lewis, 1984; White et al., 1989).

Experimental group studies, though one of the most valuable research strategies for comparing the effects of alternative interventions, have not been adequately employed to examine the effectiveness of a parents as therapists approach with a traditional clinical approach to speech therapy. Thus, the present study was designed to compare the costs and effects of a home parent training approach versus a traditional clinic-based approach to early intervention speech therapy using a randomized experimental design.

Review of Related Research

Gatling and White (1987) reviewed 162 early intervention studies that included a substantial parental involvement component (including, but not limited to, speech-related intervention). They subdivided the studies into two main categories based on the types of parent involvement used: (a) parental assistance to the child; and (b) support provided to parents and family. Eighty-one percent of the studies with parental involvement components included primarily or solely involvement of the first type, parental assistance to the child, and specifically as developmental therapists for their children.

Both the Gatling and White review and a review by Reeder and Casto (1984) reported that over 150 studies cited in recent reviews of the early intervention research supported the conclusion that parents can be effective teachers of their disadvantaged, at-risk, or handicapped children (e.g. Bronfenbrenner, 1974; Comptroller General, 1979; Dudzinski & Peters, 1977; Garland, Swanson, Stone, & Woodruff, 1981; Goodson & Hess, 1975; Gordon, 1969; Heinz, 1979; Reisinger, Ora, &

Frangia, 1976; Simeonsson et al., 1982; Weikart, 1975). More specifically, a number of studies have concluded that parents can function effectively as speech and/or language therapists for their children (e.g. Arnold, Myette, & Casto, 1986; Barnett et al., 1988; Hatten & Hatten, 1971 Levenstein & Sunley, 1967; McDonald, Blott, Gordon, Spiegel, & Hartmann, 1974; Miller 1983; Seitz & Riedell, 1974).

Several reviewers (Ambron-Robinson, 1977; Parker & Mitchell, 1980; Simeonsson et al., 1982; White et al., 1989) have cautioned, however, that there have been serious methodological weaknesses in most of the studies of parental involvement. Studies specifically focusing on parents as speech and/or language therapists have been no exception. In many of the studies, comparison groups were not appropriate, data collectors were seldom naive, interrater reliability for dependent variable scores were frequently not obtained, and cost effectiveness was seldom addressed. Although a fairly wide range of dependent measures has been used in the studies that have been reviewed, often these measures were nonstandardized, making it difficult to make comparisons across studies and to generalize the findings to a larger population. The study reported here was designed to address some of the most significant methodological problems of previous research by using a randomized experimental design, naive diagnosticians, and a wide variety of standardized measures.

Methods

Granite School District's Project PITCH program in Salt Lake City, Utah hosted this research which included forty 3- to 5-year-old children with speech disorders who were randomly assigned to either a traditional, clinic-based program in which children received service directly from a professional speech pathologist, or to a home parent training program in which children received services from their parents who were being trained by a professional speech pathologist twice a month.

Project PITCH (Preschool Intervention and Training for Children with Handicaps) had served preschool handicapped and developmentally delayed children (age birth to 5 years) within Granite School District since 1975. Since its beginning, Project PITCH had provided a home-based service with an emphasis on training parents to provide special intervention services for their children. Special education teachers, speech pathologists, a social worker, and a registered nurse comprised the Project PITCH staff that provided services to approximately 100 children during a 9-month school year. Forty of these children solely required speech and language related services.

Based on a developmental evaluation using the Brigance Diagnostic Developmental Inventory of Early Development conducted by one of the staff members, it was determined whether a particular child demonstrated serious developmental delays or a handicapping condition that would interfere with his/her learning. The specific criterion for inclusion in the program was that the child be at least 1 year delayed in at least one developmental domain. Two speech pathologists provided the speech related services examined by this study. Each carried a case load of 20 children and wrote an Individualized Educational Program for each child with assistance from the child's parents.

Program staff reported that previously collected data on student progress had demonstrated that parents were able to work successfully as teachers for their preschool developmentally delayed or handicapped children and were committed to their role in providing this service. While the traditional PITCH service model was based on the assumption that providing service via parents as interventionists is more cost-effective than traditional child-centered therapy, PITCH personnel had never tested their assumption and were interested in conducting an objective evaluation of this hypothesis. Hence, Project PITCH personnel supported this research project with the objective of determining whether involving parents in direct service as therapists to their children is indeed as effective as a traditional clinical model with minimal parent involvement.

During the first year of the study, research activities were coordinated by the two speech therapists who communicated directly with the EIRI site coordinator. Both therapists were informed of all research procedures, and regular weekly contacts with the EIRI coordinator assured that these procedures were followed. During the second year of the project, 12 of the 40 children whose age and speech delays still met the qualification criteria for the project continued to be served in their respective programs. The other 28 subjects no longer met the qualification criteria, either in terms of age or speech delays, but were followed during the year. One speech therapist coordinated all of the research activities during the second year and also communicated directly with the EIRI site coordinator. In the remainder of this report, the cohort of subjects which continued to receive services during the second year will be referred to as the "Continuing Cohort" and the cohort of subjects which exited the program will be referred to as the "Follow-up Cohort."

Subjects

A total of forty 3- to 5-year-old children and their parents were included as subjects in the study. The following section will summarize the methods used in recruiting and assigning subjects to treatment groups. Additionally, the results of the assignment to groups will be presented with respect to demographic characteristics.

Recruitment. Children were identified for speech therapy services in the Granite School District through several processes during the first 2 months of the school year, beginning September, 1987. No subjects were enrolled in the study thereafter. The majority of those identified were children of parents who, suspecting a speech problem, contacted their school or school district that, in turn, referred the children to the Project. Parents who had been served by Project PITCH in previous years were also asked to refer others to the program who might need service. Additionally, all schools in the district informed their teachers, who then informed parents of the Project PITCH services that were available. Other referral sources included the State Department of Health, local pediatricians, public health nurses, and social services agencies, a special article in the area newspaper and public service radio spots.

Children qualified for inclusion in the project on the basis of age and speech articulation abilities (children 3-5 years of age, performing below the 5th percentile on the Goldman-Fristoe, Sounds-in-Words Subtest qualified). Additionally, these children were at least 6 months to a year delayed in one or more of the domains of the Battelle Developmental Inventory. Of the 41 children identified for services, 40 of the parents elected to participate in the research. The parent who did not choose to participate was only interested in obtaining direct therapy for the child in the home; a service provided by neither of the treatments in the study.

Assignment to groups. Children who met the age and speech requirements were included as potential subjects. After receiving informed consent agreements from the children's parents, the Project PITCH therapist in charge of coordinating child enrollment contacted the EIRI coordinator and provided the articulation status and age data. After stratification on these variables, subjects were randomly assigned to groups by the EIRI coordinator to ensure that no program staff had no influence on what treatment a particular child would receive. Additionally, since children were enrolled continuously over a 2-month period, the dates in which children were identified were carefully tracked to ensure that children were assigned to treatments in the order in which they were identified.

Demographic characteristics. Of the 40 children who qualified for service, 22 were 3-year-olds while 18 were 4-year-olds. At the time of enrollment, subjects assigned to the traditional clinic-based program ranged in age from 37 to 57 months (mean = 46.2, SD 5.32), while subjects assigned to the home parent training program ranged in age from 39 to 58 months (mean = 48.0, SD 6.47).

As can be seen in Table 16.1, with the exception of number of siblings, no statistically significant differences ($p < .10$) between the two treatment groups were found on any of the demographic variables. The sample population was predominantly male, consisting of 33 males and 7 females, who, with one exception, lived in homes with both the mother and father. The predominance of males in this study is consistent with findings of several studies that have indicated that males tend to comprise approximately 71% of the preschool children requiring speech and language therapy (Department of Education, 1984). The preponderance of children in this sample who were white and from two parent homes, however, are not representative of the total population of children who receive speech therapy. Thus, these variables should be kept in mind when generalizing the findings of the study to other populations.

This sample represents a somewhat diverse group with respect to parent educational and income levels. A total of 10 (25%) of the mothers' highest completed year of education was the 12th grade. While the other 30 (75%) of the mothers indicated some college education, a total of 16 (53%) of the 30 reported that the high school diploma was the highest diploma received. Of those who obtained college educations, 12 (30%) received bachelor's degrees and 2 (5%) received master's degrees. Although not statistically different, it should be noted that there were almost twice as many mothers in the clinic-based group (9) who received college degrees than in the home parent training group (5). This finding is important because it has been suggested that parent education correlates positively with child

Table 16.1

Pretest Comparability of Groups on Demographic Characteristics

	Clinic-Based Child Centered			Home Parent Training Parent Centered			
Variable	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n	P Value
• Age of child in months as of 7/1/87	46.2	(5.32)	20	48.0	(6.47)	20	.34
• Age of mother in years	32.7	(5.64)	20	33.0	(4.72)	20	.84
• Age of father in years	35.7	(5.92)	20	34.7	(7.36)	20	.87
• Percent male*	85%			80%		20	.69
• Years of Education for Mother	14.5	(1.85)	20	14.0	(1.64)	20	.37
• Years of Education for Father	14.5	(1.87)	20	14.5	(1.70)	20	.79
• Percent with both parents living at home	90%		20	100%		20	.15
• Percent of children who are caucasian*	100%		20	100%		20	1.00
• Hours per week mother employed	11.3	(17.09)	20	8.0	(13.27)	20	.49
• Hours per week father employed	40.0	(11.82)	18	41.5	(4.72)	20	.63
• Percent of mothers employed as technical managerial or above*	15%		20	20%		20	.69
• Percent of fathers employed as technical managerial or above*	70%		20	65%		20	.74
• Total household income	$26,149	(9,262)	20	$28,749	(8,131)	20	.35
• Percent with mother as primary caregiver*	95%		20	100%		20	.32
• Percent of children in day care more than 5 hours per week*	10%		20	0%		20	.15
• Number of siblings	2.3	(1.42)	20	3.3	(1.92)	20	.08
• Percent with English as primary language	100%		20	100%		20	1.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

performance (Scarr & Weinberg, 1983). Hence, the home parent training group may have been slightly disadvantaged in this regard.

With respect to economic status, parents' incomes ranged from $11,000 to over $50,000 per year. A total of 25 (63%) of the parents reported a yearly income of less than $30,000, while 12 (30%) of the parents reported a yearly income between $30,000 and $40,000 and 3 (8%) reported a yearly income over $40,000, only one of whom reported an income greater than $50,000.

It is also interesting to note that of the 40 mothers involved in the study, 25 (63%) were unemployed and 15 (37%) were employed, although only 5 (13%) reported working full-time (40 hours per week or more). Since this study examined the effects of parents (mothers) as home interventionists, it is especially important to note that there was no significant difference between the groups with respect to the number of mothers unemployed nor with respect to the number of hours employed per week.

Table 16.2 summarizes the demographic data on the two cohorts from the second year of the study. As can be seen, no statistically significant differences were found for the main effects of cohort or treatment group except for age of child which was expected since the older children were in the follow-up cohort and the younger children were in the continuing cohort. A statistically significant interaction was found for age of mother with continuing home-based mothers being younger than follow-up home-based mothers, but follow-up clinic-based mothers being younger than continuing clinic-based mothers. The same relationship was seen with respect to age of fathers where a statistically significant interaction was also found. These significant interactions do not seriously impact the interpretations of main effects since these were only two differences based on 17 comparisons for the interaction variable, and may have been chance occurrences.

Table 16.2

Pretest Comparability of Groups within each Cohort on Demographic Characteristics

Variable	CONTINUING COHORT						FOLLOW-UP COHORT						BY TREATMENT GROUP		BY COHORT		BY GROUP BY COHORT	
	CLINIC BASED			HOME BASED			CLINIC BASED			HOME BASED			ANCOVA	P	ANCOVA	P	ANCOVA	P
	X	(SD)	n	X	(SD)	n	X	(SD)	n	X	(SD)	n	F	value	F	value	F	value
Age of child in months as of 7/1/88	43.6	(4.9)	7	43.4	(4.4)	5	47.6	(5.1)	13	49.9	(6.5)	14	.30	.58	7.34	.01	.41	.53
Age of mother in years	38.3	(6.7)	7	32.8	(4.7)	5	32.3	(3.81)	13	35.5	(4.8)	14	.47	.49	.94	.34	6.3	.02
Age of father in years	40.5	(7.3)	7	34.6	(5.5)	5	34.8	(4.0)	13	37.3	(8.2)	14	.54	.47	.42	.52	3.32	.07
Percent male*																		
Years of Education for Mother	14.1	(2.2)	7	14.0	(1.6)	5	14.6	(1.7)	13	13.7	(1.7)	14	.61	.44	.04	.84	.30	.58
Years of Education for Father	14.3	(1.9)	7	15.6	(1.5)	5	14.4	(1.9)	13	14.1	(1.7)	14	.63	.43	1.29	.26	1.68	.20
Percent with both parents living at home	100%		7	100%		5	84.6%		13	100%		14	1.00	.33	1.00	.33	1.00	.33
Percent of children who are caucasian*	100%		7	100%		5	100%		13	100%		13	1.00	.33	1.00	.33	1.00	.30
Hours per week mother employed	7.8	(15.2)	7	14.0	(17.1)	5	13.2	(18.3)	13	3.5	(7.3)	14	.12	.73	.26	.61	2.44	.13
Hours per week father employed	35.7	(16.2)	7	42.0	(4.0)	4	43.1	(7.5)	13	40.1	(.27)	14	.29	.59	.81	.37	2.36	.13
Percent of mothers employed as technical managerial or above*	.00	(.00)	7	.20	(.45)	5	.23	(.44)	13	.14	(.36)	14	.19	.67	.45	.51	1.22	.27
Percent of fathers employed as technical managerial or above*	.71	(.48)	7	.80	(.45)	5	.69	(.48)	13	.57	(.51)	14	.01	.92	.53	.47	.36	.55
Total household income	26,357	(12,095)	7	34,900	(23,144)	5	25,769	(8,227)	13	27,678	(6,389)	14	1.78	.19	1.00	.33	.72	.40
Percent with mother as primary caregiver*	1.00	(.00)	7	1.00	(.00)	5	92.3%	(.27)	13	1.00	(.00)	14	.46	.50	.46	.50	.46	.50
Percent of children in daycare mother than 5 hours per week*	.14	(.38)	7	.00	(.00)	5	.07	(.27)	13	.00	(.00)	14	1.93	.17	.17	.68	.17	.68
Number of siblings	2.71	(1.89)	7	2.60	(1.14)	5	2.07	(1.12)	13	3.57	(2.14)	14	1.34	.25	.08	.78	1.83	.18
Percent with English as primary language	100%		7	100%		5	100%		13	1.00		14	1.00	.33	1.00	.33	1.00	.33

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

Intervention Programs

During the first year of the project, two speech pathologists, one for each of the two interventions, devoted 20 hours per week to serving a caseload of 20 children each. The first year included a seven-month intervention period from October to May. During the second year, one therapist delivered both sets of services which included a caseload of 12 children; 7 in the clinic-based group and 5 in the home parent training group. The second year included an eight-month intervention period from September through April. In both years, the same phonetic and phonological approaches were used in each group. The phonetic approach included techniques such as: demonstration of sound placement; auditory training for sound discrimination; sound practice in isolation and nonsense syllables; sound rehearsal in single word production, short phrases, sentences, and extended speech. With the phonological approach, the relationships between sounds and language were examined. Instead of correcting each misarticulated sound one at a time, the child's speech was analyzed for patterns of errors, and the child was taught to contrast his or her incorrect feature use with the use of the proper feature. Additionally, children in both groups received training in language skills and minimal practice in other developmental areas where delays were indicated including personal/social, adaptive, motor, and cognitive domains.

Clinic-based program. One group of children received a traditional clinical approach in which therapy was provided to groups of two children by a certified speech pathologist. This service was delivered in a clinic-based setting for 1 hour each week.

Using the pretest results, the pathologist for the clinic-based program paired children with similar sound errors. The parents in this group were involved in setting goals for the children's Individualized Educational Program (IEP), as is required by P.L. 99-457, although the parents were not present during any of the therapy sessions and received no formal training for working with their children at home. Based on records kept during the project, the pathologist in the clinic-based group typically spent 10 to 12 hours per week in service and 8 to 10 hours per week in preparation and record keeping activities during the first year of the project. During the second year, the pathologist spent 2 to 3 hours per week in services (7 children) and 2 to 3 hours per week in preparation and record keeping activities.

Home parent training. The second group of children received therapy at home from their mothers who were trained in speech therapy techniques. The training of the mothers occurred during 40-minute visits twice a month made by a certified speech pathologist.

Parent training included techniques for correcting articulation problems, techniques in auditory training, and the appropriate sequence for teaching sounds as followed in the clinic-based group (isolation, nonsense syllables, single words, and connected speech). At each session, the speech pathologist evaluated the child informally to instruct mothers in procedures to be used during the following weeks. Mothers were provided with task-analyzed procedures that included charting techniques and data-keeping methods as a basis for the mother to adapt therapy as the child progressed.

The speech pathologist in the home parent training group was responsible for evaluating the child and training the parent while the parent was responsible for conducting the child's therapy and maintaining the data. Parents were encouraged to work daily with their children and to maintain a minimum schedule of 20 to 30 minutes of therapy, four times weekly. Based on records kept during the project, the therapist in the home parent training program typically spent approximately 7 hours per week training mothers, 4 to 5 hours in transit, and between 7 to 8 hours in preparation and record keeping during the first year of the project. During the second year, the therapist spent approximately 3 to 4 hours per week training mothers, one hour in transit, and 2 to 3 hours in preparation and record keeping.

Treatment verification. Between December 1, 1987, and March 15, 1989, data were collected to document the nature of the early intervention program at Project PITCH and to verify that the alternative treatments were being implemented as was intended. Additionally, these activities were used to identify areas needing improvement in the program and means for meeting these needs once they were identified. Several different types of data including child attendance data, data about the degree to which parents were involved, videotaping of interventions, and the supervisors evaluations of therapists were included and are discussed briefly below.

Attendance Data. Attendance data were kept continually by each interventionist, and completed forms were submitted monthly to the EIRI site coordinator. The coordinator reviewed attendance to determine if any subjects' attendance was irregular. If this was found, the coordinator arranged to talk with the intervenor to see how attendance for that particular child could be encouraged. Attendance data were then compiled by an EIRI clerk who calculated each child's attendance rate.

Attendance was high in both groups. During the first year, the mean attendance rate in the clinic-based treatment was 88%, ranging from 74% to 100% attendance. The mean attendance rate during the first year in the home parent training group was 96%, ranging from 85% to 100% attendance. Although attendance was quite high in both groups, this difference in attendance between groups was statistically significantly different ($p < .001$). As might be expected, this finding indicates that the home-based program was more conducive to higher rates of attendance since the intervention was brought to the child's home.

During the second year, the attendance rate for the home parent training group remained at the same high level, but the attendance rate for the clinic-based group dropped somewhat. The mean attendance rate for the home parent training group was

96% during the second year with the individual attendance rate ranging from 88% to 100%. The mean attendance rate for the clinic-based group was 66% during the second year, with the individual attendance rates ranging from 18% to 94%. The difference in attendance was found to be statistically significant (p< .05).

Parent Involvement Data. Four procedures were used for assessing the level of parent involvement during the first year: (1) parents were interviewed over the telephone twice during the year by a third party interviewer from EIRI; (2) parents were evaluated by the two therapists regarding their involvement with their child who was receiving therapy; (3) parents were interviewed (after the therapist evaluation) by the therapists regarding their involvement; and (4) parents were ranked by the therapists using the Quality of Parent Involvement Form. During the second year, parents were interviewed by EIRI staff twice regarding their involvement.

The results of these first-year procedures (see Table 16.3) indicated that the parent reports to the therapist and their reports to a third party interviewer were moderately correlated (r = .459, p = .001) with a 65% agreement rate between the two types of reports. These data show that parents in the home parent training group reported spending significantly more minutes per week working with their child than parents in the clinic-based group. It is important to note that although the two are correlated, parents' reports given to the therapist were noticeably higher than reports of time given to the third- party interviewer. Additionally, there was some indication during the interviews that parents in the clinic-based group were defining "time spent with child" differently from parents in the home parent training group. Clinic-based parents seemed to be more liberal in their definition, including time spent reading with the child or incidental conversation, while home-based parents mainly included structured activities aimed at speech remediation. Nevertheless, parents in the home parent training program spent statistically significantly more hours than the clinic-based parents working with their children on speech related activities ($p < .01$) (see Table 16.3).

Table 16.3

Comparability of Groups of First Year Parent Involvement for Project PITCH

Variable	Center-Based Child Centered			Home-Based Parent Centered			Effect Size $^{\Delta}$	P Value
	$\overline{X}$	(SD)	n	$\overline{X}$	(SD)	n		
Estimates by Therapists **(average # of minutes per week)**	131.1	(51.72)	20	132.9	(52.86)	20	.04	.91
Parents' Reports to Therapists 1 = < 1 hr. per week 2 = 1-2 hrs. per week 3 = 2-3 hrs. per week 4 = 3-4 hrs. per week 5 = > 4 hrs. per week	3.1	(1.76)	20	4.0	(1.34)	20	.61	.10
Parents' Reports to Third-Party Interviewer 1 = < 1 hr. per week 2 = 1-2 hrs. per week 3 = 2-3 hrs per week 4 = 3-4 hrs. per week 5 = > 4 hrs. per week	2.4	(1.73)	20	3.7	(1.099)	20	.94	.01
Parents' Understanding of Child's Condition 1 = low 2 = average 3 = high	2.2	(.47)	20	2.6	(.50)	20	.78	.03
Parents' Support of Child's Program 1 = low 2 = average 3 = high	2.4	(.51)	20	2.7	(.60)	20	.39	.27

$$^{\Delta}\ \text{ES} = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

Interestingly, reports made by the therapists prior to formally interviewing parents about their time spent working with their child did not correlate significantly with either of the other reports of parent time (i.e., 50% and 40% agreement rating were found between the ratings and the third party interview and therapists' interviews, respectively). Both therapists estimated the parents in their group to be spending approximately 1-1/2 hours per week. For the home parent training therapist, this estimate was noticeably lower than either of the parents' reports of their time. Although less noticeable, the clinic-based therapists' estimate was also considerably lower than the parents' reports of their time.

The fact that these data do not correlate highly with one another suggests that parent involvement is very difficult to assess without using observational techniques which were beyond the scope of this study. Consequently, these data do not provide a means for reliably partitioning parents according to the number of hours they spent working with their child each week. For purposes of treatment verification, however, these data, especially the data reported by the parents themselves, do suggest that parents in the home parent training group tended to be more involved with their child's development than the parents in the clinic-based group, although an exact estimate of time differences is difficult to make.

Table 16.3 also presents the results of the interviewers' ratings of the Quality of Parent Involvement. These results suggest that the groups were comparable with respect to parents' level of support for their child's respective program. As can also be seen, the parents in the home parent training group were rated significantly higher than parents in the clinic-based group with respect to knowledge of their child's condition.

Supervisor's Evaluation of Therapists. The PITCH supervisor conducted observational evaluations of the two therapists twice during the first year. During the second year, one therapist delivered both interventions and was evaluated once during the year. The evaluations indicated that the therapists were performing "outstandingly" in each of the areas evaluated: academic expectations, academic learning time, classroom/case management, curricular congruence, direct instruction, homework, parental involvement, rewards for achievement, teacher questioning practices, monitoring student progress and evaluative feedback, and reinforcement of self-concept.

Videotaping of the Treatments. Two intervention sessions were videotaped during both the first and second year in each of the treatments with the objective of documenting the activities used in a typical session. The EIRI coordinator and a third-party evaluator observed the videotapes to determine if the sessions reflected the types of practices specified for each treatment. The third-party evaluator, who was unaware of the specific objectives of the study, was asked to provide a written description of each treatment and to specify how each was similar and different from the other. The results indicated that both interventions were consistent with what was proposed.

Anecdotal Records Kept by Therapists. Anecdotal records were kept by each of the therapists. These records documented the types of therapy included in each session and reflected the respective approaches described above.

Site review. A formal site review was conducted during the first year by the EIRI coordinator to ensure that the treatments were being implemented as intended and that all predetermined procedures were being followed as specified. The site review consisted of the following: a cumulative review of six subjects' folders, direct classroom and home visit observations, interviews with interventionists, and interviews with three parents. The site review included a review of services for children, observations of interactions between staff and children, a review of curriculum materials and administration, and an evaluation of the physical arrangements. All of these areas were found to be functioning in an excellent manner with very few suggestions being made for improvement. A full report of this site is available from the EIRI site coordinator.

Therapist's Use of Time. To determine if therapists during the first year were actually spending similar amounts of time to deliver services to 20 children, they were asked to track their time over a week period, twice during the year. The results of the time tracking indicated a negligible difference between the total hours spent by the two therapists each week. The first time tracking sample indicated that the clinic-based therapist spent 19.5 hours preparing for and delivering services to her case load while the home parent training therapist spent 18.5 hours. The second time tracking sample indicated that the clinic-based therapist spent 20 hours while the home parent training therapist spent 17 hours. Both therapists reported that their time varies from week to week between 1 to 2 hours either direction. The second year therapist spent her time, proportionally, in a similar way as the therapists from year one. She spent approximately 12 hours delivering the two services to the 12 children served the second year.

Cost of alternative interventions. Determining the cost of each program alternative requires identifying all the resources necessary to operate the programs (including in-kind resources), and assigning a monetary value to them (Levin, 1983). In the present study, program personnel, parent time, facilities, transportation, and materials made up the resource requirements for both alternatives, although the programs differed in the amounts used of each of these.

The cost-effectiveness analysis was based on the value of the resources to society rather than what the program actually paid for them. Although the program paid nothing for parent time, from a societal perspective, there was an opportunity cost (e.g., parents could have been engaged in other productive activities, and the foregone activities represent a cost to them). For the present study, the amount of parent time for the clinic-based group was assigned a monetary value of $9/hour based upon women's "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). The primary costs of parent time in the home parent training group were associated with the time parents spent with the speech pathologist learning intervention techniques and the time spent implementing the intervention with their children. Costs for parent time were estimated based upon (1) program records of the actual time parents spent with the speech pathologist during home visits, and (2) the amount of time the program recommended that the parents spend providing therapy to their children each week. The estimate of parent time spent with the pathologist is very reliable. The estimate of parent time working with the child is imprecise; however, assuming a "ball park" figure of 2 hours per week allows an illustration of the potential impact on program cost of the value of parent time.

In the clinic-based program, parents' costs included only the cost of time spent in transporting children to the clinic each week (mileage costs were paid by the program). Time estimates were made from telephone interviews with parents during which parents were asked the round-trip mileage from their home to the clinic, the average time it took to drive, and whether they car-pooled. The time cost of transportation to parents was nontrivial. In fact, parents in the clinic-based program spent almost half as much time transporting their children back and forth to therapy sessions as parents in the home parent training group spent providing therapy to their children (assuming the parents actually spent the recommended amount of time on therapy). Thus, both programs required substantial parental time. The cost of the other resources used by the programs are discussed below and presented in Table 16.4.

Staff personnel costs included salary plus benefits for direct service and administrative personnel, according to the percentage of FTE devoted to each alternative program. Facilities costs were estimated using the school district's

Table 16.4

Cost Per Child of Each Program Alternative (1987-88 Dollars)

Resources	Clinic-Based (N = 20)	Home Parent Training (N = 20)
Agency Resources		
Direct Service Personnel	$1,504	$1,802
Administrative Personnel	146	146
Facilities	138	24
Transportation	84	79
Materials/Supplies	26	26
Subtotal	**$1,934**	**$2,077**
Contributed Resources		
Parent Intervention Time	0	674
Parent Transportation	295	0
TOTAL	***$2,229***	***$2,750***

daily rate for rooms. Transportation costs were based on staff mileage plus all allowances for home visits and reimbursements to parents who drove their children to the clinic-based program. Finally, the value of materials and supplies was estimated based upon the amount of consumable items used by each program during the intervention period.

Data Collection

Several measures were used to examine the effects of the two types of interventions with the speech disordered subjects. The focus of the data collection was on assessing speech production, language development, cognitive/social development, and family adaptation. The specific measures used for pretesting and posttesting are discussed below.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians completed extensive training prior to administering the Battelle Developmental Inventory. All of the diagnosticians had master's degrees and extensive experience assessing handicapped infants and children. Additionally, one speech pathologist, holding a master's degree, completed all of the speech and language tests, also after being trained. Each tester was naive to the subject assignments of those they tested. Shadow-scoring was conducted on 10% of the BDI administrations and resulted in a mean of 96% interrater agreement.

Pretesting. Parents of each child participating in the study completed an informed consent form and provided demographic information. The Battelle Developmental Inventory (BDI) was used in this study because several of the BDI domains were especially relevant to this study (cognitive, communication, and personal/social). Additionally, parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, the Family Adaptability and Cohesion Evaluation Scales, and the Family Inventory of Life Events and Changes (used only at pretest). The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the center, ensuring a controlled testing environment for all subjects. The parent, usually mothers, completed the family measures following completion of the BDI. The Family Support Scale was given to the mothers to take home if they had a spouse or spouse equivalent who could also complete it. The diagnosticians completed the testing report and then sent all data to EIRI via certified mail.

Additionally, the following language, speech, and articulation tests were given to all subjects by a trained speech therapist who was also unaware of the subjects' assignments.

Goldman-Fristoe Test of Articulation (Sounds-in-Words Subtest). The Goldman-Fristoe Test of Articulation provides a systematic means of assessing an individual's articulation of consonant sounds. It is a nationally normed test of articulation and has proved to be a reliable and valid instrument in the field of speech pathology. The Sounds-in-Words Subtest gives a raw score that is compared with national findings that, in turn, provides a percentile ranking comparing the subject's performance with other subjects of the same age.

Patterned Elicitation Syntax Test. The Patterned Elicitation Syntax Test (PEST) is designed to determine whether a child's expressive grammatical skills are age appropriate. In addition to providing age-referenced norms, the PEST is designed to provide information on a broad range of grammatical structures that typically occur in children's speech.

Preschool Language Scale (PLS). The Preschool Language Scale was designed to detect language strengths and deficiencies. It consists of two main sections: Auditory Comprehension and Verbal Ability. A supplementary articulation section is also included. Language age equivalent scores are obtained for each section.

Posttesting #1. Posttest #1 measures consisted of the BDI, parent measures, and the language, speech, and articulation measures discussed above with the exception of the PEST, which was replaced by two additional language measures described below. Additionally, a parent satisfaction with the treatment questionnaire and parent report of child's health were administered to the parents.

Test for Auditory Comprehension of Language (TACL-R). The TACL-R measures the subject's auditory comprehension of language by assessing skills in the areas of grammar, syntax, and morphology. The instrument enables the examiner to assign the subject to a development level of comprehension based on his/her performance.

Naturalistic Language Sample. Following the suggestions made by Barnie-Blackley, Musselwhite, and Rogister (1978), Shriberg and Kwiatkowski (1980), Miller (1981), and Bloom and Lahey (1978), a naturalistic language sample protocol was developed. The protocol was developed to be used twice: (1) one sample taken between parent and child, (2) one sample taken between therapist and child. The protocol consists of procedures and materials to be used in collecting the sample. The sample will result in many different types of data, both qualitative and quantitative, in four domains: articulation, pragmatics, semantics, and syntax. The advantage of such a sample is that actual language is being examined allowing for assessments of generalized skills (as collected in the parent/child sample) and optimal skills (as collected in the therapist/child sample).

Posttesting #2. Posttest #2 measures were the same as for the first posttest with two exceptions. The PLS was no longer used because a number of subjects were no longer expected to reach a ceiling. It was replaced by the Structured Photographic Expressive Language Test II (SPELT) which is described below. Additionally, the FILE was discontinued as a measure due to complaints of parents regarding the sensitivity of information it elicits and its lack of relevance to the study.

> **Structured Photographic Expressive Language Test II (SPELT II)**. The SPELT II examines the expressive use of morphology and syntax. It distinguishes children who perform significantly below others of their age in the production of grammatical structures and assesses their strengths and weaknesses in those productions.

Results and Discussion

The following section will present the results of the study with respect to the following research questions:

1. To what extent are the two treatment groups and two cohorts comparable on pretest measures of child and parent functioning?
2. To what extent are there differences between the two treatment groups on measures of child functioning at year 1 and year 2 posttests?
3. To what extent are there differences between the two treatment groups on measures of family functioning at year 1 and year 2 posttests?
4. What is the relationships between the costs and the effects of each intervention?
5. To what extent are there differences between other subgroups in the two treatment groups, such as other groups determined by the stratification variables (i.e., child age, mother education, and level of parental involvement), and the two cohorts at the second posttest?

Each of these questions will be addressed in sequence in the section that follows.

Comparability of Groups at Pretest

As can be seen in Table 16.5, no statistically significant pretest differences were found on any of the measures of child functioning (with significance criteria at $p < .10$). These statistics indicate that the children in the two groups were very

Table 16.5

Pretest Comparability of Groups on Child Functioning Measures

Variable [∞]	Clinic-Based			Home Parent Training			Effect[Δ] Size	P Value
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n		
Age of Child in months as of 7/1/87	43.5	(5.6)	20	45.4	(6.5)	20	.29	.35
Goldman-Fristoe--Sounds in Words-- # of errors	40.0	(10.88)	20	40.0	(10.42)	20	0	1.0
Goldman-Fristoe -- Sounds in Words-- Percentile Rank	4.2	(4.39)	20	4.4	(3.34)	20	.05	.88
* PEST - Raw Score	16.2	(12.40)	20	18.1	(11.86)	20	.16	.61
PEST - Percentile Rank	13.8	(26.94)	20	13.0	(22.03)	20	-.03	.92
PLS - Auditory Comprehension DQ	114.5	(19.0)	20	114.6	(13.8)	20	.28	.38
PLS Verbal Ability DQ	96.9	(18.7)	20	102.3	(18.9)	20	.38	.24
PLS - Total DQ	105.8	(103.4)	20	108.5	(15.2)	20	.35	.27
BDI								
Personal-Social DQ	76.2	(12.60)	20	76.2	(12.90)	20	.01	.99
Adaptive Behavior DQ	90.9	(14.60)	20	88.1	(13.40)	20	-.26	.27
Gross Motor DQ	99.7	(19.20)	20	102.0	(21.60)	20	.15	.47
Fine Motor DQ	93.5	(10.30)	20	90.5	(9.00)	20	-.17	.64
Motor Total DQ	95.5	(12.10)	20	94.4	(11.90)	20	-.21	.51
Receptive Communication DQ	84.8	(17.10)	20	79.8	(14.60)	20	-.18	.26
Expressive Communication DQ	77.0	(18.10)	20	71.6	(17.40)	20	-.14	. 59
Communication Total DQ	79.6	(15.30)	20	74.5	(13.30)	20	-.21	.35
Cognitive Total DQ	93.5	(10.40)	20	89.5	(11.20)	20	-.25	.44
BDI Total DQ	84.6	(9.30)	20	83.1	(11.80)	20	-.22	.48

[*] Raw Score is a sum of the total correct responses.

[∞] Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANOVAs were computed, however, using the raw score from which the DQ was derived.

$$^{\Delta}\ \text{ES} = \frac{\text{Home-based } \bar{x} - \text{clinic-based } \bar{x}}{\text{Pooled SD}}$$

comparable prior to the initiation of the intervention. The statistics also indicate the pretreatment cognitive and verbal ability levels of the subjects in the study. For example, results on the BDI indicated that the children in the study were mildly handicapped, demonstrating delays in the personal-social and communication (total and expressive) domains. Further, the pretest results on the Goldman-Fristoe, which is a more sensitive test within the communication domain than the BDI, indicated that subjects in both groups demonstrated severe speech delays and were performing at approximately the fourth percentile. Results of the PEST, which assesses imitative syntax ability, indicated that the children in each group were performing at approximately the 13th percentile.

In light of the performance levels demonstrated on the BDI, the Goldman-Fristoe, and the PEST, the results of the PLS appear to be inflated, with DQs around 100 and age-equivalent scores close to some subjects' actual chronological ages. In fact, the PLS has been cited before for producing inappropriately high age equivalents (e.g., McLoughlin & Gullo, 1984, p. 146); nevertheless, it was used in this study because it is a measure commonly used by practitioners to observe relative growth over time.

Statistically significant pretest differences were found on two of the measures of family functioning (Table 16.6). Parents in the home parent training program demonstrated higher levels of stress on the PSI than the parents in the clinic-based group ($t = -2.76$, $p < .01$), although both groups were in the normal stress range of the test (between the 15th and 80th percentiles). Total score results of the FILE and FACES indicated a similar trend; parents in the home parent training group demonstrated higher levels of stress than the clinic-based group. These general trends are important to note since it might be expected that parents in the home parent training group would experience additional stress as a result of their added responsibilities of working with their child. Results from the FACES III adaptabil-

Table 16.6
Comparability of Groups on Pretest Family Functioning Measures

Variable	Center-Based Child Centered				Home-Based Parent Centered				Effect Size$^{\Delta}$	P Value
	$\overline{X}$	(SD)	%**	n	$\overline{X}$	(SD)	%**	n		
Parent Stress Index										
Other Related (range 54 to 270)	111.84	(17.40)	35	19	133.90	(25.55)	72	20	-1.02	.003
Child (range 50 to 235)	100.65	(15.29)	57	20	105.70	(17.10)	65	20	-.31	.33
TOTAL (range 101 to 505)	211.68	(26.78)	38	19	239.60	(35.84)	71	20	-.89	.009
☆Family Support Scale Total										
Mother	27.35	(8.43)	47	20	27.60	(11.18)	50	20	.03	.94
☆Family Resources Scale Total										
Mother	124.35	(16.27)	61	20	117.95	(18.62)	48	20	-.37	.25
* FACES Raw Score - Perceived										
Adaptability (range 0 to 30)	3.2	(2.8)		20	4.6	(2.6)		20	-.52	.09
Cohesion (range 0 to 26)	5.3	(2.5)		20	4.6	(2.6)		20	-.26	.41
TOTAL (range 0 to 40)	6.7	(2.7)		20	7.0	(2.6)		20	.11	.74
FILE Total Score	8.95	(6.50)	47	20	12.60	(7.40)	29	20	.53	.11

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported on the table indicate the distance from the ideal score in raw score units. A score of 0 is best. Positive ESs indicate a negative significance.

☆Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated in the family as being available. Higher scores are considered better. Percentiles for the FSS were computed based on 643 mothers across the EIRI sites while percentiles for the FRS were based on 621 cases at the EIRI sites.

**Values in this column are percentiles.

$$^{\Delta}\ ES = \frac{\text{Home-based } \bar{x} - \text{clinic-based } \bar{x}}{\text{Pooled SD}}$$

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ity subscale indicated that the parents in the home parent training group may have been less able to adapt to changes in the home, such as the ability to adapt to increased stress levels as a consequence of providing services to their child. Based on this information, these variables were identified as potential covariates for posttest analysis.

No statistically significant differences were found on the other family measures, indicating that the families in both groups had comparable levels of family support (as measured by the FSS) and resources (as measured by FRS). Of a possible score of 72 on the FSS, both groups received a mean score of approximately 27, or 38% of the support available from individuals and agencies. Of a possible score of 150 (100%) on the FRS, the groups indicated that their material resources were 79% (118.0 points) to 83% (124.4 points) adequate for the home parent training and the clinic-based groups, respectively.

The first and second posttest analyses of the FRS, FSS, and FILE (which were not considered dependent variables, but important family description variables) indicated no statistically significant differences between the groups, ruling out reported shifts in support, resources, or significant life events as threats to validity of the study.

A two-way analysis of covariance including the two treatment groups and the two cohorts was also computed on the pretest measures of child and family functioning. No statistically significant differences were found for either of the main effects of the interaction, suggesting that the treatment groups remained balanced within each cohort with regard to family resources and support.

Posttest Measures of Speech and Language Abilities

First Posttest. Table 16.7 displays the results of the analysis of covariance on the first posttest speech and language measures between the two intervention groups. Three standardized measures of speech and language ability were used: the

Table 16.7

First Posttest Analysis of Covariance on the Speech and Language Measures

		Clinic-Based				Home Parent Training				ANCOVA		
Variable*	Covariate➡	$\overline{X}$	(SD)	Adj $\overline{X}$	n	$\overline{X}$	(SD)	Adj $\overline{X}$	n	F	ES$^{\Delta}$	P Value
Age in Months		55.5	(5.6)		20	57.4	(6.5)		20	.88	.29	.35
Goldman-Fristoe--Sounds in Words--# of errors	1, 2, 3	24.5	(12.5)	26.6	20	20.9	(13.1)	18.8	20	3.05	-.61	.09
Goldman-Fristoe--Sounds in Words--%tile Rank	1, 2, 3	20.7	(22.9)	17.6	20	27.7	(26.8)	30.7	20	2.26	.53	.14
PLS - Auditory Comprehension DQ	1, 2, 4	116.6	(14.2)	114.4	20	114.5	(12.9)	116.7	20	1.65	.44	.21
PLS - Verbal Ability DQ	1, 2, 6	110.0	(12.4)	109.0	20	114.4	(15.8)	115.4	20	3.48	.64	.07
PLS Total DQ	1, 2, 4	113.2	(11.7)	110.8	20	113.6	(13.3)	116.0	20	3.22	.61	.08
TACL-R**												
Words, Classes & Relations DQ	1, 2, 4	110.7	(23.0)	110.0	20	114.8	(17.0)	115.0	20	1.17	.39	.28
Grammatical Morphemes DQ	1, 2, 4	112.8	(25.0)	110.0	20	111.0	(21.0)	113.0	20	.76	.29	.39
Elaborated Sentences DQ	1, 2, 5	109.2	(24.0)	109.1	20	113.5	(24.0)	114.0	20	.60	.27	.44
TACL-R Total DQ	1, 2, 4	110.0	(22.0)	110.0	20	110.0	(15.0)	110.0	20	1.30	.38	.26
Parent-Child Language Sample												
Syntax-DSS	1, 2, 5	6.15	(1.59)	5.85	20	5.72	(1.29)	6.02	19	.14	.08	.71
Articulation - # of unintelligible utterances	1, 2, 7	18.2	(11.8)	20.9	20	18.3	(9.7)	15.5	19	1.80	-.50	.19
† Pragmatics - % of parent utterances requests	1, 2, 7	32.6	(13.7)	32.4	20	29.8	(10.6)	29.8	19	.28	-.21	.60
† Pragmatics - % of child utterances responses to requests	1, 2, 7	34.9	(11.2)	33.6	20	41.5	(11.0)	42.7	19	4.94	.82	.03
† Pragmatics - % of parent utterances teaching	1, 2, 8	10.7	(8.7)	10.7	20	10.8	(5.3)	10.8	18	.00	.01	.97
† Pragmatics - % of child utterances spontaneous	1, 2, 7	41.8	(15.3)	44.7	20	30.9	(13.0)	28.1	19	9.81	-1.17	.004
Therapist-Child Language Sample												
Articulation - # of unintelligible child utterances	1, 2, 9	26.2	(18.9)	29.0	20	18.2	(18.1)	15.3	20	4.37	-.74	.04
Syntax - DSS	1, 2, 7	6.51	(1.99)	6.40	20	6.86	(1.89)	6.97	20	.76	.29	.39

** Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

➡ Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Personal/Social DQ; 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Total Score DQ; 7 = BDI Expressive Communication DQ; 8 = # of hours father works per week; 9 = BDI Fine Motor DQ

* All Developmental Quotients (DQs) were calculated by dividing the age equivalent score reported in the technical manual for each child's raw score by the chronological age at time of testing and all reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

Δ $$ES = \frac{\text{Home-based adj. } \overline{x} - \text{clinic-based adj. } \overline{x}}{\text{Pooled SD}}$$

† Proportion of utterances were computed for these analyses as follows: $\frac{\text{\# of utterances of a particular type}}{\text{\# of total utterances}}$
(whether of child or of parent)

Goldman-Fristoe, the PLS, and the TACL-R. These basic measures yielded 9 different measures of speech and language functioning, three of which were statistically significant at the .10 level and which favor the home parent training group in each case. The average effect size across the three total scores from the standardized measures was .51. This suggests that there was a slight advantage for the home parent training group on the measures of speech and language functioning.

Table 16.7 also shows the main scores yielded from the two naturalistic language samples. Six scores were computed and analyzed from the parent-child language sample to examine generalized speech and language skills in articulation, pragmatics, and syntax. The number of unintelligible utterances due to articulation problems correlated significantly with the number of errors made on the Goldman-Fristoe ($r = .36$, $p = .03$), the PLS Auditory Comprehension Subscale point score ($r = -.30$, $p = .06$), and the PLS Language Age ($r = -.28$, $p = .09$). As is evident in Table 16.7, no statistically significant difference between groups was found on the number of unintelligible utterances.

Pragmatics were analyzed by examining "requesting", "responding", "teaching", and "spontaneous" language. Table 16.7 shows that, proportionally, the home parent training group had significantly more child responses to parent requests than the clinic-based group, although the percentage of parent requests to the child was comparable between the groups. Although the children in the home parent training group were scored as more responsive to their mothers, children in the clinic-based group demonstrated a significantly greater percentage of spontaneous utterances than the home parent training group.

The Developmental Syntax Score (DSS) correlated significantly with the PLS Total Language Age ($r = .57$, $p = .00$) and the TACL-R Total Age Equivalent ($r = .53$, $p = .001$), as well as numerous subscales of each of these measures (DSS of approximately 6 indicates functioning at slightly above the 10th percentile [Lee, 1974]). As is noted in Table 16.7, no statistically significant differences between groups was found on the DSS for the parent/child sample.

The number of unintelligible child utterances in the Therapist/Child sample correlated significantly with the Goldman-Fristoe percentile rank (r = -.42, p = .008), PLS Total Language Age (r = -.34, p = .037), and the TACL-R Total (r = -.28, p = .08). Results of the analysis of covariance indicated that the clinic-based group had significantly more unintelligible utterances due to articulation than the home parent training children.

The DSS performed on the Pathologist/Child Sample correlated significantly with number of errors made on the Goldman-Fristoe (r = -.27, p = .09), PLS Total Language Age (r = .44, p = .005), and the TACL-R Total Language Age (r = .37, p = .02). This DSS indicates that optimal functioning was between the 10th and 25th percentile (Lee, 1974). Results of the analysis of covariance indicated no statistically significant difference between the two groups.

Second Posttest. The results of the second posttest one-way analysis of covariance on measures of speech and language abilities are displayed in Table 16.8. As can be seen, no statistically significant difference was found on the Goldman-Fristoe Test of Articulation, although the home parent training group scored .39 of a standard deviation better than the clinic-based group. It is important to note that both groups made impressive gains since the pretest, improving from the 4th percentile to the 31st and 43rd percentiles in the clinic-based and home parent training groups, respectively. While no statistically significant differences between the groups were found in expressive use of morphology and syntax, as measured by the SPELT II, the home parent training group scored more than one-third of a standard deviation better than the clinic-based group. Differences of almost four-tenths of a standard deviation, as was found on both the Goldman-Fristoe and the SPELT II, are typically considered to be educationally significant. However, the

Table 16.8

Second Posttest Analysis on the Speech and Language Measures

Variable[*]	Covariate[→]	Clinic-Based				Home Parent Training				ANCOVA		
		$\overline{X}$	(SD)	Adj $\overline{X}$	n	$\overline{X}$	(SD)	Adj $\overline{X}$	n	F	ES[Δ]	P Value
Age in months as of 7/1/89		67.5	(5.6)		20	69.4	(6.5)		20	.88	.29	.35
Goldman-Fristoe--Sounds in Words--# of errors	1, 2, 3	13.5	(9.39)	14.84	20	12.1	(9.96)	10.76	20	1.40	-.43	.24
Goldman-Fristoe--Sounds in Words--%tile Rank	1, 2, 3	33.7	(26.2)	30.25	20	38	(28.7)	41.45	20	1.29	.41	.26
SPELT - raw score	1, 2, 4, 5	40.95	(6.7)	40.40	20	40.5	(8.8)	41.05	20	.06	.08	.81
SPELT - percent correct	1, 2, 5	81.9	(13.4)	80.79	20	81	(17.6)	82.11	20	.06	.09	.81
SPELT - percentile rank	4,5	56.0	(32.5)	53.02	20	60.5	(34.4)	63.48	20	1.19	.32	.28
TACL-R[**]												
Words, Classes & Relations	1, 2, 6	115.9	(23.2)	113.8	20	117.9	(20.7)	120.0	19	.56	.28	.46
Grammatical Morphemes	1, 2, 5	115.4	(22.2)	117.1	20	109.6	(21.9)	107.9	19	1.22	-.42	.28
Elaborated Sentences	1, 2, 6	109.2	(23.7)	112.8	20	111.6	(21.7)	107.9	19	.38	.22	.54
TACL-R Total DQ	1, 2, 6	110.7	(16.9)	111.9	20	110.2	(13.9)	109.0	19	.29	-.18	.59

[**] Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

[→] Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Personal/Social DQ; 4 = BDI Receptive Communication; 5 = BDI Communication Total DQ; 6 = BDI Cognitive DQ.

[*] All Developmental Quotients (DQs) were calculated by dividing the age equivalent score reported in the technical manual for each child's raw score by the chronological age at time of testing and all reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

[Δ] $$ES = \frac{\text{Home-based adj. } \overline{X} - \text{clinic-based adj. } \overline{X}}{\text{Pooled SD}}$$

fact that these are not statistically significant should make one cautious about interpreting them as educationally significant because the difference between the scores may be due to sampling fluctuation. If the results of replication and further study indicate that such differences are, in fact, this large, then this is an important finding.

Differences between the two group's performance was least noticeable on receptive language, as measured by the TACL-R. No statistically significant differences were found between the groups on their TACL-R scores and effect sizes were less than .30. Nevertheless, as can be seen in Table 16.8, the effect sizes which were computed indicated, in contrast to the results on the other speech and language measures, that the clinic-based group scored slightly better than the home parent training group in receptive abilities.

Posttest Measures of General Development

First Posttest. Table 16.9 shows the results of the posttest analysis of covariance between the two groups on the BDI. Again, the home parent training group demonstrated at least comparable developmental abilities to the clinic-based group. While no statistically significant difference was found on the total BDI score, the home parent training group performed statistically significantly better than the clinic-based group on the motor total subscale ($p = .06$). This difference may be due to the fact that home parent training group had a greater opportunity for interdisciplinary intervention, although it is more likely this difference reflects random fluctuation. The most educationally significant difference in general development was in the personal-social domain in which the home parent training group score approximately .50 of a standard deviation better than clinic-based group.

Table 16.9

First Posttest Analysis of Covariance on the Battelle

		Center-Based Child Centered				Home-Based Parent Centered				ANCOVA		
Variable	Covariate[†]	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	F	ES[Δ]	P Value
Age of Child in Months as of 7/1/88		55.5	(5.6)		20	57.4	(6.5)		20	.88	.29	.35
BDI[*]												
Personal-Social DQ	1, 2, 3	80.6	(15.4)	77.9	20	78.1	(13.6)	80.8	20	1.91	.20	.17
Adaptive Behavior DQ	1, 2, 4	98.4	(13.0)	97.1	20	93.5	(12.6)	94.7	20	.20	-.18	.66
Gross Motor DQ	1, 2, 5, 6, 7	97.1	(19.5)	96.4	20	107.6	(17.2)	108.3	20	2.77	.65	.11
Fine Motor DQ	1, 2, 8	89.7	(10.9)	89.6	20	92.4	(7.5)	92.5	20	1.18	.32	.28
Motor Total DQ	1, 2, 4, 7	92.2	(9.9)	92.9	20	97.6	(9.0)	96.9	20	3.79	.42	.06
Receptive Comm. DQ	1, 2, 3	90.3	(19.5)	89.7	20	84.8	(14.8)	85.4	20	.00	-.25	.99
Expressive Comm. DQ	1, 2, 9, 10	82.5	(16.2)	81.4	20	78.2	(11.9)	79.2	20	.40	-.16	.53
Communication Total DQ	1, 2, 9	85.1	(16.4)	83.9	20	80.7	(11.0)	81.9	20	.19	-.15	.66
Cognitive Total DQ	1, 2, 11	94.8	(13.4)	93.6	20	96.1	(10.7)	97.3	20	1.92	.31	.17
BDI Total DQ	1, 2, 7	88.6	(11.5)	88.3	20	88.0	(8.8)	88.3	20	1.07	.00	.31

[*] Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

[†] Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Motor Total DQ; 7 = BDI Total Score DQ; 8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ

[Δ] $ES = \frac{\text{Home-based adj. } \bar{x} - \text{center-based adj. } \bar{x}}{\text{Pooled SD}}$

Second Posttest. Table 16.10 presents the results of the One-Way Analysis of Covariance computed on the Battelle Developmental Inventory. These findings indicate that the home parent training group scored significantly higher in personal/social ability and adaptive behavior than the clinic-based group. Additional analyses of the subdomains under the Personal/Social domain are also presented in Table 16.10. Statistically significant differences were found in three of the subdomains: Expressions of Feelings/Affect, Self-Concept, and Social Role. In each case, the home parent training group scored statistically significantly higher than the clinic-based group, indicating that the home parent training program was more effective in developing the child's ability to express feelings, in self-concept development, and in developing skills relating to social role-taking. Since the univariate analyses indicated a statistically significant difference in the Adaptive Domain, it was determined that the Personal Responsibility subdomain, within the Adaptive Domain, would be examined--the Personal Responsibility subdomain was the most relevant to this population. The results of this analysis indicated that the home parent training group scored statistically significantly higher than the clinic-based group, representing a mean standard difference of .88.

Although no other statistically significant differences were found on the other domains of the Battelle, an examination of effect sizes and means indicated that the home parent training group consistently scored slightly higher than the clinic-based group, with the exception of the scores on the expressive communication subdomain. In this case, the clinic-based group scored .39 of a standard deviation better than the home parent training group. These findings do not corroborate with the findings on the individual assessments of speech and language ability. It is important to note, however, that in general communication skills as measured by the Battelle, both groups have made impressive gains since the pretest (see Table 16.5 to make comparison).

Table 16.10

Second Posttest Analysis of Covariance on the Battelle Developmental Inventory

		Clinic-Based				Home Parent Training				ANCOVA		
Variable*	Covariate→	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	F	ES$^{\Delta}$	P Value
Age of Child in Months as of 7/1/89		67.5	(5.6)		20	69.4	(6.5)		20	.88	.29	.35
BDI												
Personal-Social	1, 2, 3	74.6	(14.8)	71.1	20	77.3	(18.5)	80.8	19	5.01	.76	.03
Adult Interaction	1, 2, 3	33.4	(2.5)	32.7	20	33.3	(2.7)	33.9	19	1.54	.46	.22
Expression of Feeling Affect	1, 2, 3	22.0	(2.4)	21.7	20	23.3	(1.6)	23.6	19	5.53	.92	.03
Self-Concept	1, 2, 3	25.1	(2.2)	24.5	20	25.4	(2.5)	25.9	19	2.93	.59	.09
Peer Interaction	1, 2, 3	25.1	(5.9)	23.9	20	26.1	(5.2)	27.3	19	2.53	.61	.12
Coping	1, 2, 3	10.9	(5.3)	9.9	20	11.5	(4.8)	12.5	19	1.87	.52	.18
Social Role	1, 2, 3	18.1	(4.9)	17.3	20	18.3	(4.6)	19.1	19	1.49	.38	.23
Adaptive Behavior	1, 2, 4	89.2	(14.8)	87.5	20	93.1	(13.5)	94.8	19	3.52	.66	.07
Personal Responsibility	1, 2, 3	19.8	(5.8)	18.4	20	22.3	(5.9)	23.6	19	6.49	.88	.02
Gross Motor	1,2,5,6,7	91.7	(16.1)	91.0	20	95.9	(13.8)	96.6	19	1.37	.38	.25
Fine Motor	1, 2, 8	86.7	(11.3)	87.2	20	89.3	(10.2)	88.8	19	.48	.27	.49
Motor Total	1,2,4,7	87.8	(11.5)	89.1	20	90.9	(9.3)	89.6	19	.93	.19	.34
Receptive Communication	1, 2, 3	95.4	(16.7)	92.4	20	91.7	(17.2)	94.7	19	.76	.29	.39
Expressive Communication	1,2,9,10	83.9	(18.5)	87.3	20	79.8	(7.7)	76.4	19	.93	-.39	.34
Communication Total	1, 2, 9	87.5	(14.3)	87.5	20	84.3	(10.4)	84.3	19	.00	.004	.99
Cognitive	1,2,11	94.4	(13.2)	93.5	20	93.7	(9.5)	94.6	19	.58	.27	.45
Battelle Total	1, 2, 7	86.9	(11.8)	86.9	20	88.0	(9.6)	88.0	19	1.21	.36	.28

* Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

→ Covariates: 1 = PSI Total score; 2 = FACES Adaptability Subscale; 3 = BDI Receptive Communication; 4 = BDI Adaptive Behavior; 5 = BDI Gross Motor; 6 = BDI Motor Total DQ; 7 = BDI Total Score DQ; 8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ.

$$^{\Delta}ES = \frac{\text{Home-based adj. } \bar{X} - \text{center-based adj. } \bar{X}}{\text{Pooled SD}}$$

Posttest Measures of Family Functioning

First Posttest. No statistically significant differences were found between the groups on the PSI or the FACES (see Table 16.11). The means for both groups remained within the normal or healthy stress range and indicated that neither approach led to a change in stress or family adaptability and cohesion as measured by the PSI or the FACES (see Table 16.11).

Results of the Parent Satisfaction Questionnaire indicated, overall, that parents in both groups were "moderately" to "very satisfied" with the service they received. Nevertheless, parents in the clinic-based program expressed some negative feelings about their child's program. Group means were different on three of the Parent Satisfaction items: Satisfaction with Goals ($p < .04$), Opportunity for Parent Participation ($p < .000$), and Satisfaction with Program ($p < .07$). Further, when asked to state their preference for either a clinic-based or home parent training program, 70% of the 40 parents preferred the home parent training services (see Table 16.12). The advantages and disadvantages parents reported for each type of intervention were as follows:

Advantages of home-based:

Parent learning
Teaching in home environment
Parent-child relationship
Daily teaching

Disadvantages of home-based:

Little time/interruptions
Hard to work with own child
Lack of socialization

Advantages of center-based:
Regular schedule
Child works with professional
Socialization

Disadvantages of center-based:
Driving/babysitters
No parent-child interaction
No on-going training

Second Posttest. Table 16.11 presents the results of the One-Way Analysis of Covariance on the measures of family functioning at the second posttest. These results indicate that there were no statistically significant differences between

Table 16.11

Second Posttest Analysis of Covariance on the Battelle Developmental Inventory

		Clinic-Based				Home Parent Training				ANCOVA		
Variable*	Covariate→	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	F	ES$^{\Delta}$	P Value
Age of Child in Months as of 7/1/89		67.5	(5.6)		20	69.4	(6.5)		20	.88	.29	.35
BDI												
Personal-Social	1, 2, 3	74.6	(14.8)	71.6	20	77.7	(18.1)	80.7	20	5.34	.58	.03
Adult Interaction	1, 2, 3	33.4	(2.5)	32.8	20	33.4	(2.7)	33.98	20	1.61	.46	.21
Expression of Feeling Affect	1, 2, 3	22.0	(2.4)	21.8	20	23.4	(1.6)	23.6	20	5.55	.84	.02
Self-Concept	1, 2, 3	25.1	(2.2)	24.7	20	25.5	(2.5)	25.8	20	1.56	.47	.22
Peer Interaction	1, 2, 3	25.1	(5.9)	23.9	20	26.0	(5.1)	27.1	20	2.64	.58	.11
Coping	1, 2, 3	10.9	(5.3)	9.9	20	11.8	(4.9)	12.7	20	2.45	.56	.13
Social Role	1, 2, 3	18.1	(4.9)	17.2	20	18.4	(4.5)	19.2	20	1.99	.43	.17
Adaptive Behavior	1, 2, 4	89.2	(14.8)	87.5	20	91.9	(14.2)	93.5	20	3.03	.57	.09
Personal Responsibility	1, 2, 3	19.8	(5.8)	18.4	20	21.6	(6.5)	22.9	20	4.77	1.37	.04
Gross Motor	1,2,5,6,7	91.7	(16.1)	91.0	20	95.2	(13.7)	96.0	20	1.50	.37	.23
Fine Motor	1, 2, 8	86.7	(11.3)	86.8	20	88.4	(10.7)	88.3	20	.48	.26	.49
Motor Total	1,2,4,7	87.8	(11.5)	88.8	20	90.2	(9.6)	89.2	20	1.07	.34	.31
Receptive Communication	1, 2, 3	95.4	(16.7)	93.0	20	90.9	(17.1)	93.3	20	.43	.22	.52
Expressive Communication	1,2,9,10	83.9	(18.5)	86.4	20	79.6	(7.5)	77.1	20	.40	-.24	.53
Communication Total	1, 2, 9	87.5	(14.3)	87.4	20	83.9	(10.3)	83.9	20	.01	.03	.93
Cognitive	1,2,11	94.4	(13.2)	93.3	20	92.7	(10.3)	93.8	20	.54	.26	.47
Battelle Total	1, 2, 7	86.9	(11.8)	86.6	20	87.4	(9.7)	87.7	20	1.50	.39	.23

* Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

→ Covariates: 1 = PSI Total score; 2 = FACES Adaptability Subscale; 3 = BDI Receptive Communication; 4 = BDI Adaptive Behavior; 5 = BDI Gross Motor ; 6 = BDI Motor Total DQ; 7 = BDI Total Score DQ; 8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ.

$$^{\Delta}ES = \frac{\text{Home-based adj. } \bar{X} \text{ - center-based adj. } \bar{X}}{\text{Pooled SD}}$$

Table 16.12

First Posttest Comparability of Groups on Parent Attitudes Questionnaire

	Clinic-Based	Home Parent Training
Parents' perceived positive changes in child's behavior as a consequence of child's training.	85% (17/20)	90% (18/20)
Parents' perceived improvement in parent-child relationship as a consequence of child's training.	70% (14/20)	80% (16/20)
Parents would choose to have child in this service.	55% (11/20)	95% (19/20)

the groups in stress, as measured by the PSI, or in family adaptability and cohesion as measured by the FACES III. The home parent training group did, however, score slightly less healthy than the clinic-based group on the FACES III Adaptability and Cohesion subscales and on the FACES III Total score.

When asked at the end of the second year which program they would like to participate in if they were given the choice, once again the majority of the participating 40 parents chose the home parent training groups indicating that they valued being involved with their children's educational program, even if there was no measurable difference due to their involvement.

Posttest Subgroup Analyses

First Posttest (Summary). Analyses on the first posttest data were conducted on three subgroups to examine the effects of the two interventions comparing: (1) three-year-olds versus four-year-olds, (2) children whose mothers had a maximum of a high school education versus children whose mothers had attended college, and (3) children in the home parent training group whose mothers had reported working with them more than three hours per week versus children in the home parent training group whose mothers had reported working less than three hours per week. The results of these analyses are summarized below.

Group by age. The results of this set of analyses indicated a trend favoring the 3-year-olds in the home parent training program over the 3-year-olds in the clinic-based program in verbal ability and a general tendency for the 3-year-olds in the home parent training program to benefit more than all of the others in the two programs. Specifically, home parent training 3-year-olds scored higher than clinic-based 4-year-olds on the PLS verbal ability DQ [t(15)=2.46, p = .05], the PLS Auditory Comprehension DQ [t(15) = 3.37, p = .01], and the PLS total DQ [t(15) = 3.25, p =.01]. Additionally, this same group of home parent training 3-year-olds scored higher than the home parent training 4-year-olds on the PLS Auditory Comprehension DQ [t(18) = 2.60, p = .05] and the PLS total DQ [t(18) = 2.75, p =.05]. On the PLS Auditory Comprehension DQ, the clinic-based 3-year-olds performed better than the clinic-based 4-year-olds [t(18) = 2.75, p = .05] and the home parent training 4-year-olds [t(20) = 2.30, p = .05]. Mothers of the home parent training 3-year-olds, however, were more stressed than the other mothers in the study. These findings, if substantiated with additional research, may suggest that age is an important determinant of the most appropriate type of parent involvement to be used in a child's program and that stress may be a special consideration when working with mothers of 3-year-olds.

Level of mother education. While it might be expected that less educated mothers be less effective with their children, these findings do not support this belief. Contrarily, of the children in the home parent training group, there were no measures on which the children of more highly educated mothers performed significantly better than those whose mothers had received only a high school education. In fact, there were several measures on which the children of less educated mothers with higher education performed significantly better than the children of mothers with higher education in the home parent training group. This may be due to the fact that the less educated mothers appeared to more seriously take the responsibility they were given to work with their child, while the mothers with higher education tended to assume they were able to work with their child without the training and suggestions provided by the therapist. Further, less educated mothers experienced lower stress, again suggesting that they may adapt well to such a role.

While these findings may suggest that we dismiss the notion that less educated mothers are ineffective as therapists to their children, it should be noted that even the lowest levels of education of mothers in this study (all of whom had completed the 12 grade) were not as extreme as is often prevalent in other populations. Therefore, additional research should examine the question of the effect of mother's educational levels on their ability to work effectively as therapists for their children.

Level of parent involvement. The first year of this study attempted to examine the critical variable of parent time and the challenge of measuring parent time spent with the child in education-related activities. One methodological conclusion that can be drawn is that it is vital that parent time measurement be triangulated so that reliability can be tested in a number of ways. Second, it was concluded that in the absence of an extensive naturalistic study on parent time, estimates of parent time collected by means used in this study were suspect.

Given the questionable nature of the time data that was collected, conclusions about the effects of variable time spent working with the child in the home parent training group can be drawn only with caution. While it is possible to distinguish two groups based on the reported number of hours spent each week with the child, in most cases there were no significant differences between the performances of the children in each group. Nevertheless, the "more than 3-hours-per-week" group did perform significantly better than the lower time-group on articulation, and the mothers demonstrated lower stress. It appeared, in fact, that the children whose mothers spent less than 3 hours per week working with them performed no better than the children in the center-based group who were provided therapy by the professional therapist 1 hour per week. These results suggest that parent time committed to working with their child may be directly associated with child performance. However, additional research is vital in order to more reliably measure parent time actually spent with the child and its subsequent costs and effects.

Second Posttest Subgroup Analysis by Cohort. The most meaningful subgroup analyzed from the second posttest data was a comparison of the effects of the interventions on the follow-up cohort versus the continuing cohort. To set the context of this analysis it is important to note that analysis of parent reports of additional services, for the follow-up cohort, indicated no significant difference between the two treatment groups; children in the clinic-based, follow-up cohort received a comparable amount of intervention service during the follow-up year as the home parent training follow-up cohort. These data indicate that according to parent reports, most children in the follow-up cohort did not receive speech therapy services during the follow-up year.

No statistically significant differences between groups or between cohorts were found on the Goldman-Fristoe Test of Articulation at the second posttest, although effect sizes favored the home parent training group (see Table 16.13). As can be seen, both cohorts of children in the home parent training group performed better than the clinic-based group in their respective cohorts. Interestingly, the two home parent training subgroups scored comparably, and indicated that the second year of intervention had remediated the speech disorders of the continuing children to a

Table 16.13

ANCOVA's on Speech and Language Measures at the Second Posttest

		Continuing Cohort								Follow-up Cohort								BY TREATMENT GROUP		BY COHORT		BY GROUP BY COHORT	
		CLINIC BASED				HOME BASED				CLINIC BASED				HOME BASED				ANCOVA	P	ANCOVA	P	ANCOVA	P
Variable*	Covariates§	X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	X	(SD)	Adj. $\bar{x}$	n	F	value	F	value	F	value
Age of child as of 7-1-89		64.4	(4.8)		7	64.8	(4.6)		5	69.2	(5.4)		13	70.9	(6.4)		15	.26	.61	7.6	.01	.10	.75
Goldman-Fristoe Sounds in Words--# of errors	1,2,3	19.6	(6.3)	19.0	7	15.4	(12.8)	14.7	5	10.2	(9.3)	12.0	13	11.0	(9.1)	10.6	15	.57	.46	2.48	.13	.20	.66
Goldman-Fristoe - Sounds in Words - - %tile Rank	1,2,3	15.7	(10.6)	17.1	7	33.8	(33.6)	35.9	5	43.4	(27.2)	38.7	13	39.4	(28.0)	40.6	15	.88	.35	1.70	.20	.80	.38
TACL-R**																							
TACL-R Total DQ	1,2,4	115.2	(19.8)	114.3	7	120.5	(14.7)	115.6	5	108.3	(15.5)	111.9	13	106.2	(11.7)	108.5	15	.03	.86	.73	.40	.23	.64
Words, Classes & Relations DQ	1,2,4	119.6	(22.9)	118.0	7	119.3	(18.4)	120.7	5	113.9	(24)	111.1	13	117	(21.4)	120.0	15	.40	.53	.18	.67	.16	.70
Grammatical Morphemes DQ	1,2,5	118.7	(30.2)	118.2	7	123.6	(14.1)	121.3	5	113.6	(17.6)	116	13	104.6	(21.6)	105	15	.19	.66	1.18	.29	.84	.37
Elaborated Sentences DQ	1,2,4	115.0	(25.3)	115	7	122.3	(30.7)	113.9	5	106.1	(23.3)	113.7	13	106.8	(17.2)	107.6	15	.17	.69	.20	.66	.11	.74
SPELT II Raw Score	5,6	42.0	(6.3)	41.5	7	39.2	(7.3)	38.5	5	40.4	(7.1)	40.3	13	40.9	(9.4)	42.3	15	.04	.84	.26	.61	.89	.35
SPELT II Percent Correct	4,5,7	84.0	(12.5)	81.9	7	78.4	(14.7)	77.6	5	80.8	(14.4)	80.5	13	81.9	(18.9)	85.0	15	.00	.98	.31	.58	.69	.41
SPELT II Percentile Rank	5,6	65.6	(31.5)	63.1	7	50.2	(37.3)	47.5	5	50.8	(32.9)	50.4	13	63.9	(34.0)	69.6	15	.03	.87	.19	.66	2.52	.12

*Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVA's were computed, however, using the raw score from which each DQ was derived.

¶ Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Personal/Social DQ: 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Total Score DQ; 7 = BDI Expressive Communication DQ.

**Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

$^{\Delta}$ ES - $\dfrac{\text{Home-based adj. }\bar{x}\text{ - clinic-based adj. }\bar{x}}{\text{Pooled SD}}$

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similar level as the follow-up children. The two clinic-based subgroups, however, were less comparable indicating that the second year of clinic-based intervention did not result in a substantial gain.

Subgroup analysis by cohort on the TACL-R indicated very comparable performance of children across all four cohort/intervention subgroups. Cohort subgroup analysis on the SPELT II (also shown in Table 16.13) and the Battelle (shown in Table 16.14) indicated no significant differences due to cohort or cohort/intervention interactions. Analyses on the measures of family functioning indicated a significant interaction on the FACES Adaptability scale and the FACES Total score.

Conclusions

The most important finding of this study was that with appropriate training and on-going assistance, the mothers provided therapy for speech correction, language acquisition, and general development to their moderately speech disordered children as effectively as did the professional speech pathologist. On some of the measures, the children for whom therapy was provided by their mothers actually performed better than those who received therapy from the professional speech pathologist. On the other hand, it appeared that the children and mothers in the home parent training program were considerably less likely to engage in free, spontaneous communication with each other after the mothers were trained to work directly with the child. This finding suggests a possible drawback to a parents-as-therapist approach. Nevertheless, the overall findings of this study support the controversial claims made by experts as early as 1948 (see Lillywhite, 1948), that mothers should not be excluded from the speech training of their delayed and handicapped children because they can be effective speech therapists to their children and given major responsibilities in meeting their child's educational needs (Sommers et al., 1959; Sommers, 1962; Sommers et al., 1964; Tufts & Holliday, 1959).

Table 16.14

ANCOVA's on the Battelle Developmental Inventory at Second Posttest

		Continuing Cohort								Follow-up Cohort								BY TREATMENT GROUP			BY COHORT			BY GROUP BY COHORT		
		CLINIC BASED				HOME BASED				CLINIC BASED				HOME BASED				ANCOVA			ANCOVA			ANCOVA		
Variable	Covariates§	X	(SD)	Adj. $\overline{x}$	n	X	(SD)	Adj. $\overline{x}$	n	X	(SD)	Adj. $\overline{x}$	n	X	(SD)	Adj. $\overline{x}$	n	F	ES$^{\Delta}$	P value	F	ES$^{\Delta}$	R value	F	ES$^{\Delta}$	P value
Age of child as of 7/1/89		64.4	(4.8)		7	64.8	(4.6)		5	69.2	(5.4)		13	70.9	(6.4)		15	.26		.61	7.6		.01	.10		.75
BDI*																										
Personal-Social DQ	1,2,3	80.6	(16.9)	77.8	7	86.7	(26.2)	94.4	5	71.3	(13.1)	64.4	13	74.7	(14.5)	76.7	15	5.80		.02	7.32		.01	.18		.67
Adaptive Behavior DQ	1,2,4	88.0	(19.1)	87.9	7	99.0	(14.7)	102.9	5	89.9	(12.7)	85.1	13	89.5	(13.7)	90.5	15	3.81		.06	2.44		.13	1.16		.29
Gross Motor DQ	1,2,5	97.5	(13.4)	95.6	7	100.3	(13.6)	97.6	5	88.5	(17.0)	89.9	13	93.5	(13.8)	96.8	15	.77		.39	.43		.52	.31		.58
Fine Motor DQ	1,2,6	91.6	(10.5)	88.3	7	94.6	(10.1)	93.6	5	84.0	(11.2)	86.7	13	86.3	(10.3)	87.9	15	.68		.42	.89		.35	.38		.54
Motor Total DQ	1,2,7	93.0	(9.7)	89.6	7	95.9	(6.8)	94.0	5	84.9	(11.7)	87.5	13	88.3	(9.8)	91.1	15	1.63		.21	.63		.43	.02		.89
Receptive Communication DQ	1,2,3	99.1	(17.3)	93.7	7	98.3	(17.6)	102.5	5	93.4	(16.8)	92.0	13	88.5	(16.8)	91.2	15	.48		.49	1.34		.26	.91		.35
Expressive Communication DQ	1,2,8	93.3	(16.2)	92.7	7	79.2	(6.9)	75.4	5	78.9	(18.2)	82.9	13	79.7	(7.9)	80.1	15	3.59		.07	.26		.61	2.62		.12
Communication Total DQ	1,2,8	94.4	(14.5)	93.1	7	87.7	(10.2)	87.6	5	83.7	(13.2)	83.8	13	82.6	(10.4)	84.0	15	.33		.57	2.24		.14	.51		.48
Cognitive Total DQ	1,2,9	97.1	(13.2)	95.6	7	97.2	(11.0)	95.5	5	93.0	(13.5)	93.0	13	91.2	(10.0)	94.4	15	.03		.87	.19		.67	.03		.86
BDI Total DQ	1,2,10	91.4	(12.3)	91.5	7	92.9	(11.1)	90.6	5	84.4	(11.2)	84.0	13	85.6	(8.8)	88.3	15	.25		.62	2.36		.13	.84		.37

*Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVA's were computed, however, using the raw score from which each DQ was derived.

§ Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Fine Motor DQ; 7 = BDI Motor Total; 8 = BDI Communication Total DQ; 9 = BDI Cognitive DQ; 10 = BDI Total.

$^{\Delta}$ ES = $\dfrac{\text{Home-based adj. }\overline{x}\text{ - clinic-based adj. }\overline{x}}{\text{Pooled SD}}$

Some educators and parents believe that redefining parents' roles to include teaching or providing therapy for their children puts undue strain on the parent-child relationships. The argument is, "It's demanding enough to be parents; don't expect them to be teachers as well." It must be acknowledged that some parents with speech disordered children may not choose or welcome the opportunity of being trained as a speech paraprofessional for their children. In some cases, the added responsibility may result in excessive stress. In this study, however, we did not find statistically significantly higher levels of stress among parents who provided therapy to their children.

The results of the cost analysis indicate that, excluding the value of parent time, there was no meaningful difference in cost between the two approaches. However, when we include the value of parent time as a real cost to the program, the high parent involvement program may cost over 20% more than the clinic-based program. From an economic perspective, which alternative is the most cost-effective is not clear. In general, those who operate programs that rely heavily on parent involvement need to understand the opportunity costs to parents. If parents are willing to pay the price (i.e., devote the required time and energy to training and intervention), then a home training program, based upon the evidence presented here, may work as well or better than a clinic-based program staffed by a professional speech pathologist, and it may even be the most cost-effective alternative. However, in the present study, most mothers did not work outside the home, were not single and/or on welfare, were well educated, and were, in all respects, middle class. In short, they chose to invest the time to participate. Obviously, this will not always be true. How validly this program's success could be generalized to a disadvantaged population is not known. For parents who already feel stress, a home training program requiring significant amounts of time and energy may not be as effective as a clinic-based program. Thus, the decision as to which alternative is "best" according to economic criteria is dependent upon the context of the intervention and can only be determined by those making the individual programming decisions, especially including parents. It should be noted that, in this case, parents overwhelmingly preferred the home parent training program.

Clear advantages and disadvantages were cited for each approach. These findings suggest that administrators actually have two viable programming options: one which relies heavily on parents and one which does not. Weighing the pros and cons of these two options, at this point, can only be done on a program by program basis.

As has been discussed, P.L. 99-457 was not designed solely for the children but for the parents as well; its intent is to strengthen the parents' role in the educational process. This study has helped to identify the effects of varying degrees of parent involvement so that children with special needs and their families can be most satisfactorily served.

Future Plans

Currently, second posttest language sample data are being analyzed and will be included in the annual report next year.

During the 1989-90 year, the 40 subjects in the study will be followed and posttested again in the Spring. Several strategies will be used to track the subjects during the year. First, parents will be contacted by phone twice during the year. As a part of this contact, they will be interviewed regarding the types of services their child is receiving at that time, the satisfaction with current services and their perceived need for services. Second, birthday cards and holiday greeting cards will be sent to each child in order to track address changes. Third, staff at the Granite School District will notify the EIRI coordinator of any new addresses which they are aware of.

One of the main tasks for the 1989-90 year is to prepare several journal articles about the first two years of this study. One article will be prepared for an academic journal, one for a practitioner's journal, and one for a parent's journal. Additionally, presentations will be made at professional conferences as well as at local school districts who have expressed an interest in the study.

Finally, a review of available measures to be used during the testing in the Spring of 1990 will be conducted. Since the subjects will have aged considerably by that time it is likely that it will be necessary to replace the Battelle with another general developmental assessment such as the Woodcock-Johnson and that the speech and language measures will also need to be changed. Consultation with psychometricians in these areas will be made and testers will be trained to administered the new measures following procedures used in previous years.

UTAH PARENT INVOLVEMENT STUDY (1985)

Project #17

Comparison: Moderately to Severely Handicapped Children--Center-based intervention plus parent training versus center-based intervention only.

Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Marcia Summers and Glenna Boyce

Location: Salt Lake City, Utah

Date of Report: 10-9-89

Rationale for Study

One of the most frequent claims of researchers, administrators, and practitioners is that parent involvement in early intervention produces better results for children than no parental involvement (Bronfenbrenner, 1974; Garland, Swanson, Stone, & Woodruff, 1981; Johnson & Chamberlin, 1983; Karnes & Lee, 1978; Lazar, 1981; Parker & Mitchell, 1980; Simeonsson, Cooper, & Scheiner, 1982). In an examination of reviews of early intervention literature, the most frequently cited concomitant variable was parental involvement. Virtually all previous reviewers who have examined the benefits of involving parents in early intervention programs have concluded that parental involvement is associated with increased benefits for children (see White, Bush, & Casto, 1985, 1986).

Although the claim that parent involvement is beneficial for children is widely accepted, there is little empirical evidence to support this view. Relatively few studies have used the experimental method to test the notion that parental involvement is more effective than no parent involvement, and most of these are not of good quality (White et al., 1989). Even fewer studies have used random assignment of subjects to differing treatment conditions. Lack of random assignment in early intervention research is largely due to the ethical concerns of offering treatment in a random manner. White and Pezzino (1986) have addressed the validity of such concerns and concluded that the infrequent use of randomization has been a serious impediment to the advancement of knowledge about the efficacy of early intervention. They argue that such designs are feasible to implement and, if properly conducted, are neither unethical nor illegal. The use of methodologically well-designed studies which includes random assignment of subjects is one of the best ways of determining whether there are benefits associated with involving parents in early intervention programs.

As yet in the literature, little attention has been paid to the concept that there are many definitions or types of parent involvement programs with probably many variations in consequent effects. Care must be used in generalizing the benefits (or effects) of one type of parent involvement program to other types of parent involvement. The term "parent involvement" is perhaps too global a term. More specific terms are needed to identify variations of parent involvement. Furthermore with the varieties of "parent involvement", one study (even if it is methodologically sound) cannot answer the question of the effectiveness of parent involvement. A series of studies are needed to answer this question and build a sound base of information concerning the benefits of parent involvement.

This study investigated a typical parent involvement program by investigating the immediate and long-term effects of the addition of a parent instruction program to an already existing center-based intervention program for the children. The parent instruction was primarily designed to improve parent's skills as teachers of their handicapped child, but it also included an information component and a support component for the parents.

In addition to assessing the impact of a parent instruction program with child progress measures, this study assessed the possible changes that this instruction had on the family. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1979; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Additionally, most previous studies were conducted with disadvantaged children; moderately and severely handicapped children may present sufficiently different problems so that the relationship between behavioral parent instruction and overall family functioning may not be present or at least may be different.

Review of Related Research

The involvement of parents in their children's education has long been considered important. White et al. (1989) identified six rationales frequently cited as to why parental involvement is necessary: (1) Parents are responsible for the welfare of their children; (2) Involved parents provide better political support and advocacy; (3) Early intervention programs which involve parents are more effective; (4) By involving parents, the same outcome can be achieved at less cost; (5) The benefits of early intervention are maintained better if parents are involved; and (6) Parent involvement provides benefits to parents and family members as well as the child.

While these rationales for parent involvement would appear to be logical and sensible, the evidence from the research to date on parent involvement is less than conclusive. Table 17.1 presents the White et al. (1989) analyses review of 12 studies that examined the effects of adding a parent involvement component to early intervention for handicapped children. First, various types of program comparisons

Table 17.1

Effects of Adding a Parent Involvement Component to Early Intervention Studies with Handicapped Children

Reference	Description of the Comparison	Quality	Primary Focus Parental Involvement	Secondary Focus Parental Involvement	Effect Size
Direct Comparisons of Benefits of Parent Involvement:					
Barnett, Escobar, & Ravsten, 1987	Center and home intervention vs. center intervention	fair	Parent as therapist	—	.26
Henry, 1977	Daycare program plus parental vs. daycare program alone	fair	Parent as therapist	—	.72
Minor et al., 1983	Center-based intervention plus parental involvement vs. center-based intervention alone	poor	Parent as therapist	—	2.21
Miller, 1981	Preschool developmental class plus at-home program vs. preschool developmental class alone	poor	Parent as Therapist	Parent/child relations Emotional support Resource Access	.16
Scherzer, 1976	Physical therapy plus parent training vs. physical therapy alone	poor	Parent as therapist	—	.50
Indirect Comparisons of Benefits of Parent Involvement:					
Bidder et al., 1975	Parents as therapists vs. home-based intervention by health care professional	good	Parent as therapist	Emotional support	1.07
Barnett, Escobar, & Ravsten, 1987	Home-based intervention by parents vs. center-based intervention	fair	Parent as therapist	—	.19
	Center plus home-based interventions home intervention	fair	Parent as therapist	—	.15
Shelton, 1978	Reading to children by parents vs. traditional nursery school	fair	Parent as therapist	—	.05
Goodman et al., 1984	Hospital-affiliated program plus parental involvement community daycare programs alone	poor	Parent as therapist	Emotional support	.51
Allen et al., 1980	Parent-child interaction intervention vs. traditional intervention	poor	Parent/child relations	Parent as therapist Emotional support	.90
Horton, 1976	Hearing aid before the age of 3 plus parental involvement vs. hearing aid alone	poor	Parent as therapist	Sensory stimulation Emotional support Child Develop. Educ.	.83
Kysela et al., 1981	Extensive home-based training to parent vs. center-based intervention to child with moderate parental involvement	poor	Parent as therapist	—	-.42

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have been made in order to address different research questions about parent involvement. For example, some of the research designs have compared home-based, parent intervention with center-based intervention, asking which is better--home-based parent or center-based professional intervention. Others have compared a center-based intervention with the same center-based intervention to which has been added a parent involvement component, asking whether or not the addition of parent involvement will make a significant contribution to the child's development. It is logical to expect different findings when different comparisons are made. In 1985, when this study was initiated, center-based programs adding a parent-as-therapist component was a popular and frequently-used intervention program. Since evidence did not exist as to the benefits of this type of parent involvement, and since it was so frequently used, this type of design was a logical choice.

Second, various methodological problems have been found in the research. Table 17.1 addresses the issue of study quality. "Study quality" refers to the assessed threat to internal validity for that particular study. (For further information concerning the manner in which these studies were rated, see the final report of the Early Intervention Research Institute, 1987.) None of the studies which used direct comparison were rated any better than "fair," indicating that serious methodological concerns characterize this literature. One good study indirectly compared the benefits of parent involvement. However, indirect comparisons (that is, a comparison in which parent involvement is one of several variables, such as setting or age-at-start, which are experimentally manipulated) are generally so confounded as to give little information on the effectiveness of parent involvement. Given the weaknesses of the studies and the lack of positive effects shown in Table 17.1, the alleged benefits of parent involvement in early intervention programs have not been well documented.

Furthermore, other important questions have not been addressed in the research. One question which needs addressing is the relationship between parental child management skills and overall family functioning. Several investigators have suggested such a link (e.g., Koegel et al., 1982; Patterson, 1980; Patterson & Fleishman, 1979; Wahler et al., 1979). However, additional research is needed to determine the nature of these effects; they might be positive or negative. Clarke-Stewart (1982) suggested that perhaps parent involvement programs may serve to make the mother more anxious or unsure, and failure to measure maternal variables would obscure this result. Secondly, few studies provide cost-benefit information, despite general claims that parent involvement saves money. Thirdly, none of the studies report data from follow-up testing, and retention of parent involvement is not known. Since studies involving disadvantaged children have cautiously suggested that some benefits due to parent involvement may be long-lasting (Haskins & Adams, 1982), the importance of longitudinal research in this area becomes obvious. Thus, the goal of this research was to determine the immediate and delayed impact of adding a structured parent instruction program to an existing center-based early intervention program that provided minimal parent involvement.

Overview of Study

Fifty-one moderately and severely handicapped children were randomly assigned to a center-based early intervention program plus parent instruction or a center-based intervention alone. The goal of this research was to determine the impact of adding a structured parent instruction program to an existing center-based early intervention program.

Treatment was provided at two early intervention centers located in the greater Salt Lake City, Utah area. All children were involved in a 3-hour, 5-day-per-week, center-based preschool program. Mean age of the children at the beginning of the intervention was 46.1 months. The children were randomly assigned to one of two groups, the center-based only group or the center-based plus parent instruction group. Although the children were in different groups for the research analyses, they were mixed together in classrooms at the centers.

The parents of the "center-based plus parent instruction group" attended parent instructional workshops provided one time per week (90 minutes) for 15 weeks during the winter months of 1986, in addition to the regular parent functions at the centers. The Parents Involved in Education (PIE) curriculum was used in the workshops. The parents in the "center-based only" group continued to be included in the regular parent functions provided by the centers. All children and parents (usually mothers) were tested prior to, immediately after, and one and three years following the implementation of the parenting groups. Results were determined through use of analysis of variance and analysis of covariance, with respective pretests and mother education as covariates.

Method

Subjects

Fifty-one moderately and severely handicapped children were included in the study. Thirty-one subjects were classified as developmentally delayed. Other handicapping conditions included orthopedically impaired (8 subjects), sensory impairment (2 subjects), Down syndrome (9 subjects) and behaviorally impaired (1 subject). In the remainder of this section, the procedures for recruiting subjects and assigning them to groups will be summarized. The demographic characteristics of children in each group will be discussed, and the effect of subject attrition will be summarized.

Recruitment. Preschool children, and their families, who were participating in classes taught at the two centers, were considered for inclusion in this study. The Battelle Developmental Inventory was used as a screening instrument to determine children's eligibility for services. To be eligible for services, children had to score at least 1-1/2 standard deviations below the mean in at least two areas, or 3 standard deviations below the mean in one area. Parents of these children were sent a letter inviting them to participate in the research, and inclusion in the study was based on parents' willingness to participate without prior knowledge of treatment group assignment. Subject recruitment for this cohort was completed in November 1985.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups. Prior to the initiation of treatment, parents were either assigned to a group in which they received instruction in parent workshops or to a group in which parents did not attend parent workshops. The group not receiving additional parent instruction continued to receive the same level of parent involvement that was available through the centers.

To increase the probability of having comparable groups, subjects were assigned to groups randomly after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six possible mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their DQ test scores obtained from a number of assessment instruments previously administered as part of the eligibility process for receiving services at the centers.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination for the subject with the lowest DQ score, in each age by motivation cell was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups.

Demographic characteristics. Table 17.2 shows the comparison of the parent instruction and center-based only groups on a number of demographic variables at the time of pretest. Few significant differences between the groups can be found in terms of demographic characteristics. Children in the comparison group had a significantly higher number of siblings, and their mothers had a significantly higher level of education than did mothers in the parent instruction group. Number of siblings was found to be unrelated to measures of child and family functioning, but maternal education correlated significantly with a number of the measures. The use of the variable maternal education as a covariate in all subsequent analyses will be discussed later.

Attrition. Two subjects were lost between the pretest and first posttest (one parent instruction and one center-based group). The subject in the center-based group was recruited back into the study and participated in Posttests #2 and #3.

Nine subjects dropped between Posttest #1 and #2. Six were in the center-based group and three were in the parent instruction group. Attrition was due to subjects moving where there were no testers, parent's decision not be included, or subjects moving without forwarding addresses. In an effort to contact the latter group, phone calls were made to next of kin and certified letters were sent to the subject. However, these subjects could not be contacted in spite of our best efforts.

At the Posttest #3, 45 subjects and their families were tested. One of the subjects who was not included in the Posttest #3 analysis is in the process of being tested and efforts are being made to locate a tester for a family in Indiana.

Comparisons of pretest variables for those subjects who have dropped out of the study versus those who remained in the study at the time of the second posttest is found in Table 17.3, and for time of third posttest is found in Table 17.4.

Table 17.2

Comparison of Key Demographic Pretest Variables of the Center-Based and Center-Based Plus Parent Involvement Groups of the 1985 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Child age in months	46.4	8.2	25	45.7	9.9	26	.78	-.07
• Percent male[*]	56		25	69		26	.34	¦.25¦
• Mother education	14.1	2.0	25	12.7	1.8	26	.01	-.78
• Father education	14.8	2.1	24	14.5	1.9	26	.57	-.16
• Family Income[$]	$28,333	$15,588	24	$29,134	$15,896	26	.86	.05
• Mother age	33.5	5.9	25	31.5	4.7	26	.19	¦.43¦
• Father age	34.3	6.9	25	33.4	5.0	26	.62	¦.18¦
• Percent Caucasian[*]	72		25	62		26	.47	-.20
• Number of Siblings	2.6	1.4	25	1.8	.97	26	.02	¦.82¦
• Percent intact families[*]	95.7		23	92		25	.71	-.10
• Hours per week mother employed	3.2	7.5	25	7.4	12.6	26	.16	¦.33¦
• Hours per week father employed	42.3	4.5	23	40.4	2.0	25	.07	¦.95¦
• Percent fathers employed as technical/managerial or above[*]	65.2		23	48		25	.26	-.32
• Percent mothers employed as technical/managerial or above[*]	8.0		25	12.0		25	.69	.11
• Percent w/English as primary language[*]	96		25	100		26	.55	.17

NOTES:

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

[$] Income data was converted from categorical to continuous data by using the midpoint of each interval.

[^] ES =

$$\frac{\text{Center-based + PIE } \bar{x} \text{ - Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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Table 17.3

Comparison of Pretest and Demographic Variables of Subjects Who Withdrew from the Study With Those Who Completed the Second Posttest at the 1985 Utah Parent Involvement Study

								Study Status						
		Center-Based Program			Center-Based + PIE			In Study			Out of Study			
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	P value
Child Age at Pretest	IN	45.8	8.2	19	47.3	9.3	23	46.6		42	43.4		9	.34
	OUT	48.4	8.6	6	33.5	5.8	3							
Battelle Total	IN	56.1	18.1	19	55.2	12.3	23	55.6		42	53.8		9	.74
	OUT	55.6	14.8	6	50.2	14.6	3							
Total Parent Stress Index	IN	262.6	44.8	18	265.04	56.6	23	264.0		41	243.8		9	.26
	OUT	238.3	22.7	6	254.7	19.1	3							
Child Related PSI	IN	124.9	20.9	18	125.4	28.4	23	125.2		41	118.8		9	.46
	OUT	116.2	12.7	6	124.0	11.0	3							
Other PSI	IN	138.2	29.3	18	137.7	31.5	23	137.9		41	125.0		9	.22
	OUT	122.2	14.4	6	130.7	13.8	3							
Education Mother	IN	13.8	2.0	19	12.7	1.9	23	13.2		42	14.2		9	.17
	OUT	14.8	1.7	6	13.0	1.0	3							
Education Father	IN	14.6	2.4	18	14.6	1.9	23	14.6		41	14.7		9	.94
	OUT	15.3	1.2	6	13.3	2.3	3							
Income	IN	$28,249	$15,900	18	$29,826	$16,196	23	$29,134		41	$27,000		9	.71
	OUT	$28,583	$16,064	6	$23,833	$15,011	3							

Table 17.4

Comparison of Pretest and Demographic Variables of Subjects Who Withdrew From The Study with Those Who Completed Posttest #3 at the 1985 Utah Parent Involvement Study

		Center-Based Program			Center-Based + PIE			Study Status In Study			Study Status Out of Study			
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	P value
Child Age at Pretest	IN	46.4	8.5	22	46.5	9.1	23	46.5	8.7	45	42.9	11.7	6	.37
	OUT	46.3	6.5	3	39.6	16.3	3							
Battelle Total	IN	57.6	17.2	22	54.5	11.6	23	56.0	14.5	45	50.0	16.5	6	.35
	OUT	44.2	12.1	3	55.8	20.7	3							
Total Parent Stress Index	IN	257.0	44.1	21	262.7	50.1	23	260.0	46.9	44	263.0	58.4	6	.89
	OUT	253.0	14.7	3	273.0	89.5	3							
Child Related PSI	IN	122.4	20.3	21	123.9	24.9	23	123.2	22.5	44	130.3	30.2	6	.49
	OUT	125.0	12.8	3	135.7	45.0	3							
Other PSI	IN	135.1	28.7	21	136.8	28.8	23	136.0	28.5	44	132.7	29.3	6	.79
	OUT	128.0	9.2	3	137.3	44.6	3							
Education Mother	IN	13.9	2.0	22	12.7	1.9	23	13.3	2.0	45	14.2	1.7	6	.32
	OUT	15.3	1.5	3	13.0	1.0	3							
Education Father	IN	14.8	2.2	21	14.3	2.0	23	14.5	2.1	44	15.2	1.3	6	.48
	OUT	15.0	1.7	3	15.3	1.2	3							
Income	IN	$27,142	$15,486	21	$28,847	$15,259	23	28,034	15,211	44	34,000	18,841		.39
	OUT	$36,666	$16,646	3	$31,333	$24,271	3							

The results showed that the children, comparing those who remained in the study with those who did not at Posttests #2 and #3, were very similar in age and development at pretest. Likewise, comparisons of the pretest parent education levels, income, and stress scores of those parents who remained in or left the study at Posttests #2 and #3 showed that those parents who remained were similar to those who left the study. Consequently, the two groups, those who remained in the study and those who did not, were comparable and the attrition as such had not changed the comparability of the center-based and the center-based plus parent instruction groups.

Intervention Program

This section will briefly describe the treatments for the center only and parent instruction groups and will discuss treatment verification measures.

Basic Intervention (center-based treatment). Children from both the parent instruction and center-based group received the same basic educational services during the program year. All children were enrolled in a 3-hour, 5-day-per-week center-based intervention program in which they received small group and individualized teaching sessions from certified special education teachers and trained paraprofessional aides. Certified therapists provided individual motor and speech/language instruction to the children and helped teachers implement appropriate activities in these and other developmental areas. Instructional activities were developed from comprehensive assessments and were drawn from a number of curricula. Children were grouped into classrooms based on level of developmental functioning, and the average number of children per classroom was slightly less than ten. The child teacher ratio was 3.6 to 1. During a typical day, children were instructed in developmental areas such as motor, speech/language, self-help, cognitive, and social skills. As part of these basic services to children, parents were involved in IEP meetings, and teachers occasionally talked individually to parents regarding their child's program as they were dropping children off or picking them up from the preschool.

Expanded intervention (center-based plus parent instruction). In addition to the center-based treatment described above, parents in the parent instruction group participated in parent workshops which used the Parents Involved in Education (PIE) instructional package.

One of the major difficulties in doing research on the effectiveness of parent involvement is that the term is often used to mean a wide variety of things. Gatling and White (1987) identified two general types of parent involvement: (1) Those that use parents in some way to enhance the child's developmental progress, and (2) Those that provide assistance to parents or other family members to enhance family functioning, coping ability, satisfaction, or ability to manage the stress of having a handicapped child as a family member. About 80% of the studies of parent involvement analyzed by White et al. (1989) used a parents-as-therapist approach as either the sole focus or as the major focus of a parent involvement program which involved several other components. Assistance to the parents or other family members was seldom the major focus of parent involvement programs. Based upon these findings, the parent instruction curriculum for this study (PIE) was structured with a parents-as-therapist focus, but with additional components of information about child development in general and programs for disabled children, and parental support.

The PIE instructional curriculum included the following topics: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chains, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

The PIE instructional sessions were taught by a social worker and the director of one of the centers. The average group size consisted of between 8 and 12 parents. Workshops sessions consisted of 15 ninety-minute sessions, once per week excluding holidays, for a period of four months. In association with the lesson material presented, at most of the sessions parents were asked to choose target behaviors of their child (either from the IEPs or one of their own choosing). They were to plan an intervention program based on behavior management principles and to carry the program out during the week. They were asked to keep track of and report the time spent in these activities. As can be seen in the list of topics above, information concerning principles of child development and government concerns with programs for handicapped children. Finally, at each session, time was allotted for parents to form support networks and discuss challenges associated with parenting a handicapped child.

Treatment verification. Three methods of treatment verification were used. First, parent attendance was kept at the parent instructional sessions. Parent attendance at the parent instructional sessions averaged 78%, an excellent attendance record for a program of this nature. Second, at Posttest #1, a test of knowledge based on the PIE curriculum was given. The test of parent knowledge, given to both the parent instruction and the center-based groups at the time of the first posttest, showed a significant difference in favor of the parent instruction group (p =.01). These findings support the claim that the treatment was received by the parents as it was intended, and that parents gained the knowledge presented in the PIE instructional package. Third, parents turned in tracking sheets indicating hours per week spent with the child to verify home assignments. Direct observation was not used because of the costliness and potential obtrusiveness of the methodology.

Cost of alternative interventions. It is important to determine the cost of adding a parent involvement component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. The costs of implementing a parent instruction program like that used in this study were estimated based on a similar program offered the following year at the same center (1986 Utah Parent Involvement Study). All aspects of the program on which the cost data were based were the same (i.e., number of sessions held, the people conducting the sessions, and the approximate number of participants). The figures were adjusted for inflation and are in 1988-89 dollars. See Table 17.5 for the cost analysis for the 1986 Parent Involvement Study.

Table 17.5

Cost Per Child for the 1986 Utah Parent Involvement Study (1987-88)

Resources	Center-Based Program (n = 174)	Center-Based + PIE (n = 29)
Agency Resources		
Direct Service	$2,885	$3,050
Administration	556	586
Occupancy	635	635
Equipment	81	81
Transportation		
Children	9	9
Staff	6	6
Materials/Supplies	47	53
Miscellaneous	27	27
SUBTOTAL	**$4,246**	**$4,447**
Contributed Resources		
Volunteer time	23	23
Parent time	381	1,105
Parent Transportation	1,195	1,265
Miscellaneous	2	2
SUBTOTAL	**$1,601**	**$2,394**
Total	***$5,847***	***$6,842***

In the cost analysis for the 1986, and similarly estimated for this study, the direct cost for the center for each child in the parent instructional program group, over that which was spent for each child at the center was approximately $200. Therefore, the addition of a parent instruction program to an existing center program is relatively inexpensive. When a value was placed on the parent volunteer time in attending the instructional sessions, the cost for each child in the parent instruction group was approximately $1000 more than for each child in the center-based only group.

Data Collection

Data collection procedures involved the recruitment, training, and monitoring of diagnosticians, and administration of pretest, Posttests #1, #2, and #3 measures.

Recruitment, training, and monitoring of diagnosticians. This project used the same diagnosticians for pretest, posttest #1, and posttest #2. At Posttest #3, new testers were trained and three of these new testers were used. Diagnosticians were recruited from graduate programs in psychology and special education at Utah State University. All had masters degrees and extensive experience assessing handicapped infants and children. They were trained through a lengthy process which involved observation of videotapes, a two-day training seminar, and required certification after administering at least three Battelles. Although these diagnosticians were aware that research was being conducted, they were uninformed as to the specific details and hypotheses of the study. They were also unaware of the children's assignments to groups. Shadow scoring was conducted on 10% of the administrations to ensure the validity of the testing procedure, and administration of the Battelle was determined to be reliable between testers more than 90% of the time.

Pretesting. Pretesting took place in late October and early November, 1985. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI), a measure of child's developmental level. The Minnesota Child Development Inventory were filled out by the mothers. The Minnesota Child Development Inventory (MCDI) is a measure of child development which is completed by the parent. It includes gross and fine motor, expressive language, comprehension, self-help and personal-social subscales. (Stanford-Binet IQ, Bayley Infant Development Scale, and Sequenced Inventory of Communication Development scores were also available through testing conducted by the centers prior to the child's acceptance into the program.) The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the centers. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed a demographic survey and the Parenting Stress Index (which measures stress and coping behavior in the parent-child system). Information pertaining to the reliability and validity of the Battelle and the Parent Stress Index may be found in the first annual report (White and Casto, 1986). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttesting #1. Posttesting occurred at the end of the school year in 1986 during the last two weeks of May and the first week of June, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery for the child consisted of the Battelle Developmental Inventory and the Minnesota Child Development Inventory, which was completed by the mothers. Information regarding the child's IEP (Individualized Educational Plan) objectives was also obtained. Posttest measures for the parent consisted of the Parent Stress Index; the Family Support Scale (assesses the availability and helpfulness of different sources of support to families); the Family

Resource Scale (measures the extent to which different types of resources are adequate in households with young children); a test of parent knowledge concerning the use of behavioral principles taught in the PIE instruction; the Family Environment Scale (assesses general family functioning in ten areas: cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active recreational orientation, moral-religious emphasis, organization, and control); the Child Improvement Locus of Control (assesses parental beliefs about the factors controlling the improvement of their handicapped child); the Family Index of Life Events and Changes (assesses life events and changes experienced by a family unit); the Impact on Family Scale (measures stress and coping); the Home Screening Questionnaire (a screening instrument designed to describe types of stimulation in the child's home environment that foster cognitive development); and, the Family Adaptability and Cohesion Scales (assesses perceived and ideal levels of family functioning).

The posttest BDI was administered by trained test examiners who were blind to subject group assignments. Parents were paid a $20.00 incentive for completing the posttest battery.

Posttesting #2. A second posttest was conducted on both treatment groups in August, 1987. (During the time between the first and second posttests, parents were not monitored for their use of the principles they learned in the parent instruction groups.) Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out the parent survey form, the Family Resource Scale, the Family Support Scale, the Parent Stress Index, the Family Adaptation and Cohesion Scale, the Family Inventory of Life Events, and measures of child health and parent satisfaction with services. After the completion of both the BDI and family measures, parents were compensated $30 for their time.

In addition, special permission was obtained to contact the public school teachers of study participants in the spring of 1988. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for teachers to participate, two brightly colored and usable classroom posters were mailed with the questionnaire. If a teacher was requested to complete more than one questionnaire, an appropriate number of posters were supplied with the use of these incentives. This questionnaire had a 100% return rate. (Several children remained in private preschool or home care settings, so data was only reported for children who had moved into the public schools.)

Posttest #3. A third posttest was taken during the summer of 1989. Procedures for this posttest were similar to that of the second posttest. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, and a demographic survey. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Results and Discussion

The purpose of this research project was to determine if the addition of a parent instruction program to an already existing center-based early intervention program would significantly add to the child's development or affect family function. In addressing these questions, the results will be discussed by first comparing the pretest scores of the children and parents in the parent instruction group with those of the children and parents in the center-based group. Next the posttest scores measured soon after the parent instruction class, a year later and then two years later, will compared.

Specifically stated, the questions which this analysis seeks to answer are:

1. What are the immediate and long-term effects of parent involvement as therapist on the young handicapped child and on the family system?
2. What is the relationship between parent involvement as therapist, child characteristics, and family characteristics?
3. Is the magnitude of the effect associated with the degree of parental participation, and how does time affect this relationship?

Pretest Comparisons. Table 17.6 presents results of the comparability of groups on pretest measures. No significant differences were found between the groups at time of pretest on either of the primary measures of child development, the Battelle Developmental Inventory or the Minnesota Child Development Inventory, or on any of their subscales. Also, there were no differences on any of the other child development measures (the Sequenced Inventory of Communication Development, the Stanford-Binet or the Bayley Infant Development Scale). Likewise, no significant differences on the family stress scores as measured by the Parenting Stress Index were found. The two groups appeared to be very comparable before the parent instruction began.

Selection of covariates for use in posttest comparisons. The majority of analyses presented are based on analysis of covariance procedures completed using SPSS-PC. Treatment group (center-based or center-based plus parent instruction) was the independent variable and dependent variables were scores on the posttest instruments. Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In

Table 17.6

Pretest Comparisons on Child and Family Measures of the Subjects in the Center-Based and Parent Involvement Groups for the 1985 Parent Involvement Study

	Center-Based Program				Center-Based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p** Value	ES^
CHILD MEASURES										
• **Battelle Developmental Inventory (BDI)**[*]										
DQs for:										
Personal Social	61.0	23.6		25	56.8	14.1		26	.45	-.17
Adaptive Behavior	55.6	16.4		25	54.6	16.8		26	.82	-.06
Motor	52.8	20.4		25	55.9	21.3		26	.59	.15
Communication	53.3	19.9		25	50.3	15.0		26	.54	-.15
Cognitive	57.4	20.9		25	54.4	16.0		26	.57	-.14
TOTAL	56.0	17.0		25	54.6	12.4		26	.74	-.08
• MCDI (age equivalent)										
General Development	25.3	8.3		24	26.5	8.8		26	.62	.14
Gross Motor	22.3	12.4		24	25.4	13.2		26	.40	.25
Fine Motor	32.2	11.2		24	32.1	10.9		26	1.00	.01
Expressive Language	27.3	12.2		24	25.5	7.8		26	.54	.15
Comprehension Conceptual	29.2	13.5		24	27.0	7.2		26	.46	-.16
Situation Comprehension	31.1	12.6		24	33.0	16.6		26	.66	.15
Self-Help	27.9	9.5		24	29.8	10.2		26	.50	.20
Personal-Social	26.8	11.9		24	28.4	12.0		26	.64	.13
• Stanford Binet IQ[&]	72.0	18.9		13	65.5	18.5		15	.37	-.34
• Bayley Infant Developmental[&]	128.0	30.5		12	134.3	13.6		12	.52	.21
• SICD (age equivalent) Receptive	26.5	9.5		24	27.4	8.6		26	.73	.09
• SICD (age equivalent) Expressive	23.5	10.6		24	22.6	11.0		26	.77	-.08
FAMILY MEASURES										
• **Parenting Stress Index (PSI) Percentile Rank**[@]										
Child Related (range 47 to 235)	122.7	19.3	90	24	125.2	26.8	92	26	.71	-.13
Other Related (range 54 to 270)	134.2	27.0	72	24	136.9	29.9	75	26	.74	-.10
TOTAL (range 101 to 505)	256.5	41.4	84	24	263.8	53.5	88	26	.59	-.18

NOTES:

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress.

[&] Data for the Stanford-Binet and Bayley Pretest are only presented for some of the subjects, because some children were functioning too high to be assessed with the Bayley or too low to be assessed with the Stanford Binet.

[^] ES =

$$\frac{\text{Center-based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical p value for assuming statistical significance was set at 0.05. Due to the statistical difference between groups at the time of pretest, maternal education was used as a covariate throughout the analyses. Also, the pretest scores of each subscale or scale was used as a covariate in the analysis of that particular scale or subscale.

Posttest comparisons of child functioning. Table 17.7 shows comparisons on measures of child functioning at Posttests #1, #2, and #3. No statistically significant differences between the parent instruction group and the center-based group were found on any of the Battelle Developmental Inventory subtest or total scores, or on the total score or subscale scores of the Minnesota Child Development Inventory at Posttest #1, signifying that the children in the two groups had made comparable developmental progress. The only exception is the personal-social subscale at Posttest #1 of the Battelle Developmental Inventory which was significantly higher for the parent instruction group than for the center-based group. This advantage was not found at Posttests #2 and #3. One significant finding out of approximately 25 could be explained as an element of chance. Within a normal

Table 17.7

Posttest Comparisons on Child Measures of Subjects in Center-Based and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-Based Program			Center-based + PIE					
Variable	Covariates[$]	$\bar{x}$[#]	(SD)	n	$\bar{x}$[#]	(SD)	n	ANCOVA F	p Value	ES[^]
Posttest #1										
• Age in months as of 6/01/86	---	52.6	8.3	24	52.6	9.6	25	.00	.99	.00
• **Battelle Developmental Inventory (BDI) DQs for:**[*$]										
Personal-Social	0, 1	63.7	23.1	24	74.9	21.8	25	7.38	.01	.48
Adaptive Behavior	0, 1	61.1	20.6	24	64.1	16.6	25	.67	.42	.15
Motor	0, 1	56.6	16.8	24	57.4	19.2	25	.06	.81	.05
Communication	0, 1	54.0	22.4	24	56.3	15.9	25	.69	.41	.10
Cognitive	0, 1	58.0	20.1	24	61.1	18.9	25	.56	.46	.15
Total	0, 1	58.4	17.9	24	62.5	14.9	25	2.40	.13	.23
• **MCDI (raw)**										
General Development	0, 1	81.2	21.9	21	81.7	23.0	25	.07	.80	.02
Gross Motor	0, 1	22.2	5.6	21	23.4	5.4	25	2.93	.10	.21
Fine Motor	0, 1	31.4	4.8	21	32.0	4.8	25	.65	.43	.13
Expressive Language	0, 1	37.9	12.2	21	39.2	9.9	25	1.14	.29	.11
Comprehension Conceptual	0, 1	32.2	15.1	21	32.4	12.8	25	.02	.89	.01
Situation Comprehension	0, 1	28.2	6.0	21	29.4	6.3	25	.94	.34	.20
Self-help	0, 1	22.7	5.7	21	22.8	5.9	25	.01	.91	.02
Personal-Social	0, 1	24.4	6.0	21	24.1	5.3	25	.10	.76	-.05
Posttest #2										
• Age in months as of 8/01/87	---	66.7	8.6	19	69.3	9.4	23	.81	.37	.30
• **Battelle Developmental Inventory (BDI) DQs for:**[*$]										
Personal-Social	0, 1	54.8	24.4	19	58.2	17.7	23	.55	.46	.14
Adaptive Behavior	0, 1	58.3	24.9	19	54.5	18.7	23	.51	.48	-.15
Motor	0, 1	54.7	28.8	19	51.8	19.9	23	.31	.58	-.10
Communication	0, 1	47.6	21.3	19	48.5	19.3	23	.07	.79	.04
Cognitive	0, 1	53.4	20.7	19	56.3	18.4	23	.41	.52	.14
Total	0, 1	52.6	19.8	19	53.3	16.5	23	.05	.82	.04
Child's General Health	--	1.9	.62	19	1.9	.5	24	.03	.86	.00
Posttest #3										
• Age in months as of 6/01/89	---	90.0	8.6	22	90.2	9.2	23	.09	.10	.77
• **Battelle Developmental Inventory (BDI) DQs for:**[*$]										
Personal-Social	0, 1	56.7	22.8	22	60.4	20.3	23	.46	.50	.16
Adaptive Behavior	0, 1	56.0	21.9	22	58.4	20.3	23	.19	.67	.11
Motor	0, 1	51.6	15.9	22	50.8	20.2	23	.05	.82	-.05
Communication	0, 1	48.3	22.1	22	47.7	18.6	23	.03	.87	-.03
Cognitive	0, 1	52.6	18.1	22	54.8	17.1	23	.38	.54	.12
Total	0, 1	51.9	16.8	22	53.5	16.5	23	.26	.62	.07

NOTES:

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[$] Covariates: 0 = This same scale taken at pretest; 1 = Highest completed year of education - Mother

[#] Covariance adjusted means.

[^]

$$ES = \frac{\text{Center-based + PIE adjusted } \bar{x} \text{ - Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

distribution of scores, several scores may be distributed above the cut-off point for the level of significance.

Posttest comparisons of family functioning. Families in the two groups appeared to be very comparable when measured by the various scales used, with no significant differences found between the groups at any of the posttests on any of the subscale or total scale scores with the exception of the adaptability score on the FACES scale at Posttest #2 (see Table 17.8). The two groups reported similar stress levels, both for child related stress and other related stress, as well as for the total stress score in the Parenting Stress Index. When compared with all the other families in the Early Intervention Research Institute longitudinal studies, these families in this study are reporting somewhat elevated stress, with their scores being in the eightieth percentile or above for total stress and child related stress and seventieth percentile or above for the other related stress (except at Posttest #3 when the other related stress for the center-based group was at the 61 percentile).

When the perceived social support and resources were compared with all the other families in the Early Intervention Research Institute longitudinal studies, these families' scores appeared to be mid-range, with these families perceiving slightly more social support than resources (see percentile scores for Posttest #1, #2, and #3 for the Family Support Scale [FSS] and the Family Resource Scale [FRS]).

As noted above, at Posttest #2, the parent instruction group was significantly more balanced in terms of adaptability on the Family Adaptability and Cohesion Evaluation Scale III (FACES). However, given the large number of tests and the lack of replication for this finding at any other posttest, it is likely that this finding is artifactual.

Other posttest #1 family measure comparisons. Several other measures of family or parent functioning were used at Posttest #1 to compare the families in the center-based group with the families in the parent instruction group. These measures also reflected the comparability of the two groups. No significant differences were found

Table 17.8

Posttest Comparisons on Family Measures of the Subjects in the Center-Based and Parent Involvement Groups for the 1985 Parent Involvement Study

Variable	Covariates[$]	Center-Based Program				Center-based + PIE				ANCOVA F	P Value	ES[^]
		$\bar{x}$[#]	(SD)	%ile	n	$\bar{x}$[#]	(SD)	%ile	n			
POSTTEST #1												
• **Parent Stress Index** [*#]												
Child Related Range (47 to 235)	0, 1	119.7	24.3	88	23	119.0	26.1	88	25	.04	.84	.03
Other Related Range (54 to 270)	0, 1	136.5	30.8	75	23	132.3	22.2	70	25	.67	.42	.14
Total Range (101 to 505)	0, 1	257.3	49.9	85	23	250.3	45.5	80	25	1.00	.32	.14
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** [+]												
Adaptability Range (0 to 24)	1	3.6	1.9		23	3.7	2.6		24	.02	.90	-.05
Cohesion Range (0 to 30)	1	4.1	2.5		23	4.4	3.0		24	.18	.67	-.12
Total Range (0 to 54)	1	5.7	2.5		23	6.3	3.1		24	.40	.53	-.24
Discrepancy	1	11.4	7.5		23	11.7	9.4		24	.01	.93	-.04
• **Family Resource Scale (FRS)** [&#]	1	118.7	22.6	51	24	120.0	19.9	54	25	.04	.85	.06
• **Family Support Scale (FSS)** [&#]	1	32.5	14.3	69	24	31.5	7.1	66	25	.07	.79	-.07
• **Family Index of Life Events (FILE)** [*]	1	11.9	5.5	29	23	10.6	6.0	34	24	.55	.46	.46
POSTTEST #2												
• **Parent Stress Index** [*#]												
Child Related Range (47 to 235)	0, 1	118.8	27.1	87	18	125.8	27.5	92	23	1.44	.24	-.26
Other Related Range (54 to 270)	0, 1	133.5	23.9	72	18	139.4	29.1	77	23	.66	.42	.66
Total Range (101 to 505)	0, 1	253.0	42.5	82	18	264.4	51.1	89	23	.99	.33	.99
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** [+]												
Adaptability Range (0 to 24)	1	4.8	2.8		19	2.8	2.4		23	5.35	.03	.71
Cohesion Range (0 to 30)	1	4.0	3.1		19	4.6	3.1		23	.36	.55	-.19
Total Range (0 to 54)	1	7.0	2.8		19	6.1	2.6		23	1.06	.31	.29
Discrepancy	1	10.1	8.0		19	13.3	8.0		23	1.54	.22	-.40
• **Family Resource Scale (FRS)** [&#]	1	113.2	26.3	40	19	119.1	20.6	51	23	.64	.43	.22
• **Family Support Scale (FSS)** [&#]	1	32.0	12.1	67	19	26.4	9.4	46	23	2.67	.11	-.46
• **Family Index of Life Events (FILE)** [*]	1	10.6	6.8	34	19	10.6	5.1	34	23	.00	.99	.00

(continued)

Table 17.8 (continued)

Posttest Comparisons on Family Measures of the Subjects in the Center-Based and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-Based Program				Center-based + PIE						
Variable	Covariates[$]	x̄[#]	(SD)	%ile	n	x̄[#]	(SD)	%ile	n	ANCOVA F	P Value	ES[^]
POSTTEST #3												
• **Parent Stress Index** [*@]												
Child Related Range (47 to 235)	0, 1	120.8	28.5	89	21	125.1	23.0	92	23	.40	.53	.15
Other Related Range (54 to 270)	0, 1	126.5	35.7	61	21	135.8	23.3	74	23	1.10	.30	.26
Total Range (101 to 505)	0, 1	252.4	51.2	81	21	252.6	42.2	81	23	.00	.99	.00
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** [+]												
Adaptability Range (0 to 24)	1	4.3	3.2		22	4.1	2.4		23	.10	.75	-.06
Cohesion Range (0 to 30)	1	3.6	2.1		22	4.4	3.2		23	.86	.36	.38
Total Range (0 to 54)	1	6.1	3.1		22	6.7	2.7		23	.41	.52	.19
Discrepancy	1	11.0	6.0		22	13.2	10.5		23	.70	.41	.37
• **Family Resource Scale (FRS)** [&@]	1	121.4	20.9	55	22	121.1	15.2	55	23	.00	.96	-.01
• **Family Support Scale (FSS)** [&@]	1	31.4	13.0	64	22	31.0	14.5	63	23	.01	.93	-.03

NOTES:

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[#] Covariance adjusted means.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[$] Covariates: 0 = This same scale taken at pretest; 1 = Highest completed year of education - Mother

[^]
$$\text{ES} = \frac{\text{Center-based + PIE adjusted } \bar{x} \text{ - Center-based adjusted } \bar{x}}{\text{Center-Based SD}}$$

[@] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children). High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

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between the two groups on the Locus of Control measures, the HOME screening questionnaire or the Family Environment Scale (see Table 17.9). A significant difference in favor of the center-based group was found for the family's active recreation orientation. Again with only one significant finding, it is likely that this finding is artifactual.

Table 17.9

Comparison of Child and Family Functioning for Subjects in Center-based and Parent Instruction Groups at Posttest #1 Using Other Measures

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Child Improvement Locus of Control								
Professional	24.6	5.1	22	24.0	12.9	25	.62	-.12
Divine Intervention	12.6	4.7	22	14.1	4.7	25	.30	.32
Parent	28.4	4.8	22	28.6	3.5	25	.88	.04
Child	23.4	5.3	22	23.3	5.2	25	.91	-.02
Chance	9.7	4.5	22	11.1	4.2	25	.28	.31
HOME Scale	42.0	6.2	22	38.6	9.1	25	.18	
Family Environment Scale								
Cohesion	53.9	9.7	24	55.3	8.9	25	.61	-.54
Expressiveness	53.4	11.4	24	51.6	12.8	25	.63	-.16
Conflict	48.2	9.4	24	45.6	9.3	25	.39	-.28
Independence	40.9	15.1	24	49.0	13.2	25	.07	.54
Achievement Orientation	49.0	9.7	24	51.5	6.9	25	.36	.26
Cultural Orientation	47.3	12.1	24	47.7	10.1	25	.91	.03
Active Recreation Orientation	46.9	13.7	24	38.3	11.6	25	.04	-.63
Moral-Religious Emphasis	60.3	10.6	24	61.2	9.9	25	.77	.08
Organization	54.4	10.5	24	54.7	7.5	25	.92	.03
Control	47.4	14.0	24	57.2	8.3	25	.005	.07

NOTES: ^ Effect Size is computed using the formula:

$$\frac{\text{Center-based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

Analysis of variance techniques were also used to test the effects of treatment condition on posttest data regarding the number and percentage of IEP objectives achieved by children. No statistically significant effects of treatment condition on posttest IEP data were found. These measures were not repeated at Posttest #2 or #3.

Parent satisfaction measures. Different forms of a parent satisfaction questionnaire were filled out by parents at both Posttest #1 and #2. Parents of both groups were satisfied with the services provided for their children at the centers (see Table 17.10). The questionnaire used a scale of 1 to 4 with possible responses ranging from poor to excellent. With all the means being above 3.0, apparently the parent satisfaction on the various items ranges from good to excellent.

Public school teacher evaluation. The results of the public school teacher questionnaire may be found in Table 17.11. It can be seen that there was no significant difference between groups at the time of the second posttest, as reported by the children's teachers. Sample sizes were small (due to part of the subjects still being in handicapped preschools and other programs), however, and some differences may emerge in subsequent follow-up.

Conclusions

This study found that the addition of a parent instructional component to a center-based preschool program for handicapped children had little effect on the child or the family. This finding is important in that this design (e.g., the center-based program for handicapped children with a limited parent instruction program which teaches the parent to provide therapy) is a frequently-used design. The findings do not support the claims that these types of programs increase the effectiveness of the intervention program or enhance the longitudinal benefits or early intervention. However, the results of this study should not necessarily be generalized to other types of parent involvement programs.

Table 17.10

Posttest Comparisons of Parent Satisfaction with Services for the Families in the Center-based and Parent Instruction Groups

	Center-based Program			Center-based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
POSTTEST #1								
Parent satisfaction with staff	3.3	.8	24	3.4	.8	25	.76	.13
Parent satisfaction with communication with staff	3.2	.7	24	3.3	.8	25	.60	.14
Parent satisfaction with program goal/activity	3.3	.9	24	3.2	.6	25	.66	-.11
Parent satisfaction with program in general	3.2	.8	24	3.4	.7	25	.29	.24
POSTTEST #2								
Parent satisfaction with staff	3.8	.5	19	3.7	.5	24	.37	-.20
Parent satisfaction with communication with staff	3.6	.6	19	3.4	.7	24	.19	-.13
Parent satisfaction with program goal/activity	3.6	.6	19	3.4	.6	24	.27	-.33
Parent satisfaction with participation	3.4	.8	19	3.1	.8	24	.27	-.36
Parent satisfaction with services	3.3	.8	19	3.2	.7	23	.54	-.13
Parent satisfaction with child progress	3.5	.7	19	3.3	.8	24	.42	-.29
Parent satisfaction with program in general	3.5	.6	19	3.2	.8	23	.26	-.49

NOTES: ^ Effect Size is computed using the formula:

$$\frac{\text{Center-based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

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Table 17.11

Results of Teacher Questionnaires at Posttest #2 for 1985 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Teaching rating of parent's:								
Knowledge	15.9	3.1	10	15.9	2.5	12	.97	.00
Support	16.6	3.5	10	17.3	2.0	12	.57	.20
Attendance	5.4	2.6	10	4.9	0.9	12	.56	-.19
• Percent eligible for Special Education services	90.0		10	100.0		12		
• Time in:								
Regular class	29.9		10	12.5		12	.25	
Self-contained class	60.0		10	84.6		12	.14	
Resource Room	0.0		10	0.0		12		
Other Class	2.6		10	2.5		112	.97	

NOTES: ^ Effect Size is computed using the formula:

$$\frac{\text{Center-based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

One might surmise that there were other variables that would account of the lack of significant differences between the center-based-only and the center-based plus parent instruction programs. Possibly, the parent instructional program of 15 90-minute sessions over a four-month period is too limited. However, the program is typical of parent instructional programs and is more intense than many. It is also worrisome that parents would have time to participate in a more intensive program. Parent attendance, and the consequent parent learning may be another variable to look at, but in this study the parent attendance was 82%, which is very high for these types of programs.

It is important to remember that this study does not address the question of whether or not parents can teach their children. It addresses the question of the benefit of adding a parent-as-therapist instruction program to a center-based preschool intervention program. It is necessary to interpret the results of this study in conjunction with other studies (i.e., the 1986 Utah and the Des Moines Parent Involvement studies) which investigate the same question. Together, the results of these three studies will help determine the effectiveness of the addition of parent instructional programs to preschool center-based intervention programs.

Parent involvement is still seen as an essential part of handicapped children's intervention programs because of the government mandate and for philosophical reasons. White et al. (1989) identified two rationales: Parents are responsible for their children's welfare, and involved parents provide better political support and advocacy. More research needs to be completed to identify the outcomes of other types of parent involvement and to explore other issues of parent involvement (e.g., the parent-child relationship).

Future Plans

Retesting of this group is scheduled for late Spring of 1990, at which time the same measures of child development and family functioning will be administered. In addition, now that all the children are in public school, the public school teacher questionnaire will be administered to the present public school teachers of the subjects. Secondly, in light of findings of the parent-interaction observations in the 1986 Utah Parent Involvement Study, it is possible that parent-interaction videotapings will also be done with the sample in this study. Thirdly, measures of child self-concept (as has been used in the Des Moines study) and measures of parent self-concept are also being considered. Finally, the use of another measure of child development is being considered because some of the children may have reached the upper limits of the Battelle Developmental Inventory. Results of the fourth posttesting will be available for next year's final report. Comparisons among the two Utah Parent Involvement studies and the Des Moines study are also planned.

ECONOMIC ANALYSES OF INTERVENTION PROGRAMS INCLUDED IN THE LONGITUDINAL STUDIES

Procedures of Economic Analysis

Economic analysis requires that the components of each alternative treatment be clearly specified. Procedures for collecting detailed data have been developed, tested, and implemented at all of the study sites. Using all available sources (e.g., written documents and interviews with project staff), a detailed description was drawn up for each intervention. Descriptive data include: (a) number of children by age, handicap, severity, and developmental level; (b) number of direct service staff, administrators, and volunteers; (c) other resources used in the intervention program; and (d) type and extent of parent involvement. These data are combined with information on the unit costs of resources to produce estimates of total program cost and cost per child.

The primary reason that economic evaluation requires a specialized cost data collection system is that project budgets usually do not accurately reflect the total costs of a program. For instance, the value of parent time is not included as a cost. Yet, the care and education of a handicapped preschooler requires extraordinary amounts of a family's resources, especially parent time, under any circumstances. Parents with handicapped children who participate in interventions may be expected to contribute significantly greater amounts of their time than other parents. Indeed, parent participation in development of the individualized education plans alone may consume non-trivial amounts of time. These time costs are important for more than economic comparisons; if time costs are sufficiently high, they may be a barrier to participation for some parents, in particular low-income, single parents.

The time costs to parents and other unpaid program personnel are referred to as opportunity costs. An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteers' time required for the longitudinal studies was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U. S. Department of Labor, Bureau of Labor Statistics, 1989).

Other resources that are frequently not found in budgets are the costs of initial staff training and set-up for a new program, "borrowed" staff, volunteers, and even facility costs. To overcome the problems with using budget figures, the costs of implementing each of the interventions studied are defined and measured using the "ingredients" method proposed by Levin (1975, 1983). In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988).

The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). In some cases, it is necessary to prorate shared costs of a resource; for example, by estimating the proportional costs to one program using a building that is shared with another program. Costs are then distributed according to constituencies, adjustments are made for transfer payments (transfer payments are shifts in income like taxes and welfare payments that are not net costs to society as a whole) and total net costs are calculated. Using this approach, it is possible to ascertain the overall costs for each alternative program as well as the costs to various contributing groups.

Since the concepts and skills involved in economic analysis are relatively new, most site staff were unfamiliar with the procedures. We have developed, tested, and revised the cost data collection forms so that they do not require a background in economic analysis to generate accurate cost data. EIRI economists were available for assistance in computing the forms. The forms were referred to EIRI for analysis and further interaction with the site if any problems or inconsistencies are noted. Described below are the general resource categories that have been used for each site. Descriptions of the individual studies contain information for that particular study about the overall costs and cost per child for each of the following resource categories:

Personnel - Cost for program personnel is divided into categories of direct service, administrative, consultants, volunteer, and parent time. Direct service and administrative costs include salary plus benefits according to the portion of FTE devoted to the alternative early intervention programs. When a program is housed within a university, the university's administrative cost is included, based upon its indirect rate. Consultant time was calculated based upon their daily rate. The value of parent and community members' time was valued at $9 per hour. Professional volunteers were estimated at $25 per hour. In most cases, parent time is based upon the number of hours parents were required to commit to the programs, for attending center- or home-based programs, or in phone calls with program staff. Although we know that most parents conducted intervention activities at home with their child, it was almost impossible to estimate how much time was spent conducting activities which would not have been done if the child had not been enrolled in the early intervention program. For those programs that outlined specific home intervention activities for parents to carry out, we did estimate parent time based upon the time recommended by the program. Thus, we provided an estimate of how much time parents would have spent if they adhered to the program at home. In all cases, we provide program cost estimates with and without the value of parent and volunteer time.

Capital assets - Occupancy, vehicles, equipment, and other investments in items with more than a 1-year life are capital assets. Their costs need to be apportioned to the relevant time period (e.g., 1987-88 school year). Annual capital costs were estimated in one of two ways: (1) the replacement cost of the capital was determined and then multiplied by an annualization factor that accounted for implicit interest and depreciation on the item (Levin, 1983); or (2) annual rental cost was used.

Transportation - Annual staff and child transportation costs were reported by each early intervention program. Staff travel included any job-related travel paid for by the program, such as home visits, travel between centers, any air travel, and consultant travel. Child transportation may or may not have been provided by the program. Parents who used their own resources to transport their child or themselves for intervention services were interviewed by phone. In the interview, they were asked the round-trip distance they were required to travel, the number of trips made, travel time, and whether or not they car-pooled. Based upon this information, parents' transportation costs were estimated at $.21 per mile and $9 per hour. In all analyses, transportation costs are estimated with and without parent costs.

Materials and supplies - Each program reported annual expenditures on consumable items (expected life of 1 year or less). This included office, classroom, and custodial materials and supplies.

Miscellaneous - Annual expenditures on anything not counted elsewhere was included in this category. It typically included such items as utilities, insurance, debt service, dues, subscriptions, etc.

Program Costs and Economic Efficiency

In this section, all of the information on program costs is summarized and those costs are discussed in relationship to measures of program outcome for each study. Factors which effect program cost will be discussed first and are summarized in Tables 1 through 3, with programs divided into 3 categories: (1) programs which varied according to the intensity of the intervention; (2) programs which included a parent involvement component, and; (3) programs which served medically at-risk children. A discussion of the cost-effectiveness of the longitudinal studies will follow.

Table 1

Costs and Effects of Parent Involvement

Site	# of Children	Age	Total Cost Per Child without Contributions	Direct Service Personnel Cost as % of Total Cost	Teacher-Parent Ratio	Caseload* for Home-based Programs	Teacher: Child Ratio for Center-based Programs	Service Hours	Effect Size	
									Child Functioning	Family Functioning
									BDI	PSI+FACES
ACDS										
center-based	121	3-5	$ 9,547	.76	N/A		1:4	690	-.13	.19
Parent training	26		$10,015	.76	1:10		1:4	708		
Parent Involvement 86										
Center-based	174	3-5	$ 4,453	.68	N/A		1:4	600		
PIE	29		$ 4,664	.69	1:9		1:4	630	.13	.08
Des Moines										
Center-based	210	3-5	$ 6,311	.64	N/A		1:5	540		
PIE I	8		$ 8,656	.70	1:4		1:5	572	.08	-.02
PIE II	14		$ 7,611	.67	1:7		1:5	564		
PITCH										
Clinic-based	20	3-5	$ 2,179	.80	1:1		1:2	36	.18	.21
Home-based	20		$ 2,028	.87		20		12		

* Caseloads imply a 1:1 ratio usually in a home- or clinic-based setting.

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Table 2

Costs and Effects of Intensity Studies

								Effect Size	
Site	# of Children	Age	Total Cost Per Child without Contributions	Dir. Service Personnel Cost as % of Total Cost	Caseload for* Home-based Programs	Teacher:Child Ratio for Center-based Programs	Service Hours	Child Functioning BDI	Family Functioning PSI+FACES
LSU IVH									
no treatment					N/A			.27	.17
treatment	18	0-5	$ 4,842	.68	9		48		
LSU VI									
low	15	0-2	$ 520	.59	15		23	.27	.20
high	15		$ 6,018	.49	15		46		
SMA/Lake McHenry									
low	386	0-2	$ 3,448	.54		1:1	36		
high	24		$ 9,498	.53		1:1	96	-.04	.08
Sunshine									
low	36	0-5	$ 3,894	.54	8		45	.07	.08
high	27		$ 7,789	.54	8		90		
ARC									
basic	82	3-5	$ 8,975	.63		1:4	1,200		
augmented	22		$11,105	.51		1:4	1,200	-.15	.22
Jordan									
low	30	3-5	$ 3,001	.57		1:4	234		
high	30		$ 4,908	.64		1:3	390	.18	.08
SLC IVH									
delayed	29	1-5	$ 988	.65	31		24		
early	33	0-5	$ 3,155	.67	27		48	.21	.10
SC IVH									
delayed	14	1-5	$ 3,168	.37	14		24		
early	24	0-5	$ 7,392	.42	12		48	-.20	.01

* Caseloads imply a 1:1 ratio usually in a home- or clinic-based setting.

Table 3

Costs and Effects of Medically At-Risk

Site	# of Children	Age	Total Cost Per Child without Contributions	Dir. Service Personnel Cost as % of Total Cost	Caseload for* Home-based Programs	Service Hours	Effect Size	
							Child Functioning	Family Functioning
							BDI	PSI+FACES
SLC/IVH								
delayed	29	1-5	$ 988	.65	31	24		
early	23	0-5	$3,155	.67	27	48	.21	.10
LSU/IVH								
No treatment					N/A			
treatment	18	0-5	$4,842	.68	9	48	.27	.17
SC/IVH								
delayed	14	1-5	$3,168	.37	14	24	-.20	.01
early	24	0-5	$7,392	.42	12	48		

* Caseloads imply a 1:1 ratio usually in a home- or clinic-based setting.

Table 2 presents those programs which varied according to intensity of early intervention; these represent the most heterogeneous group. Included are center-based programs, home-based programs, and programs which combine the two settings. Two programs served infants (0-2 years), 3 served preschool aged children (3-5 years), and 4 programs provided services to children birth through 5 years old. Staff-child ratios also varied widely, from one-to-one to one-to-four. In general, it was the home-based programs that served children one-to-one, although in the SMA program, infants were brought to a clinic to receive one-to-one intervention and in the IVH programs, children received one-to-one therapy sessions in both settings.

Programs which served medically fragile children and those with a parent involvement component were more homogeneous. All of the medically-fragile programs we studied began child focused services at 3 months adjusted age. They operated mainly a home visit program in the first year, and a combined home visit with therapy sessions at a center in the second and subsequent years. The teacher-child ratio in each of these programs was one-to-one. The parent involvement programs all served preschool-aged children. With the exception of the PITCH program, they all added a parent component to an existing center-based program. Teacher-child ratios varied from one-to-one to one-to-five.

Factors Which Explain Differences in Cost

Tables 1 through 3 provide estimates of cost per child. All cost figures were adjusted for inflation (1988 dollars) and discounted using a discount rate of 5%. Cost per child is an average cost calculated by dividing total cost by the number of children served. This includes only actual expenditures for the program. It does not include the "opportunity costs" to parents or others.

As can be seen, there was a fairly wide variation in the estimated costs of the early intervention programs that we studied. This variation probably covered the full range of costs one would expect to see in early intervention. For programs varying by intensity, costs ranged from $520 to $11,105 per child per year. For programs with a parent involvement component, costs ranged from $2,028 to $10,015 and programs for medically at-risk children ranged from $988 to $7,392. Obviously, there was substantial overlap in the cost figures across program type as well as by the three categories represented here. For example, home visit programs' cost per child may be lower than a center-based program, but not necessarily.

Given the amount of variation present in the cost of the programs we studied, it is worth noting which factors can be identified that might systematically explain some of the differences among programs. Although much of the variation in cost was due purely to local differences and incidental program idiosyncracies, we believe that a portion of the variation in cost was due to differences among programs that are a matter of choice.

Duration of services. One source of variation in the cost of these early intervention programs was the duration of intervention services. Planned service hours, across all types of programs, ranged from 12 hours per year to 1,200 hours per year. Naturally, planned service hours were more than actual service hours due to absenteeism. However, the programs were prepared to deliver services for the number of hours indicated and therefore incur costs whether or not all services were delivered.

Another aspect of duration that significantly impacted cost is the number of years of intervention that may be required. For example, SLC-IVH and SC-IVH (Tables 2 and 3) early intervention costs represented two years of intervention, which cost over twice as much as one year. Programs that began at birth, such as these, and continued until school entry can be expected to cost much more than programs that began at preschool age.

Intensity of services. Variation in the intensity of services was another source of variation in the cost of early intervention. Measures of intensity were provided by the caseload and staff-child ratio. Table 2 presents the programs in the longitudinal studies which specifically compared programs of varying intensities although both caseload and staff-child ratio varied for all programs we studied.

For most early intervention programs, child characteristics tend to impact program intensity. The two most important characteristics in this respect are age and the type and severity of handicapping condition. Younger children and more severely handicapped children require higher staff-child ratios and are naturally more expensive on an hourly basis. In the longitudinal studies, infants were usually served in a home-based program (although there are a few center-based programs, like SMA, and the IVH programs that brought children to a center for one-to-one sessions) with a staff-child ratio (or staff-parent ratio) of one-to-one. This is probably the most economically efficient arrangement for infants and severely handicapped children who require the most intense services. However, to keep cost down, home visitor programs tend to provide relatively few hours of care.

Contributed resources. The final factor affecting the difference in costs of the sites that we will discuss was variation in contributed resource cost. Table 4 presents data for the sites which separates total cost per child with contributed resources from total cost per child without contributed resources. The first two cost columns give the cost of the program without unpaid resources. These are the same figures that were presented in Tables 1 to 3. The last two columns present the cost data which includes those costs actually paid as well as those resources used by the program but where no payment was made. These costs include parent time, transportation, volunteers, etc. which were valued using the concept of opportunity cost described earlier in the section on procedures of economic analysis.

Three of the sites, ARC, Jordan and SMA/Lake McHenry, used no contributed resources so that the costs in the first two columns are the same as those in the last two columns. However many of the sites relied on significant quantities of contributed resources to implement their programs. These occurred most often in the form of parent time. The parent involvement sites, Des Moines, ACDS, PITCH, and DDI/86, had parent time costs for the parent involvement component of their programs which raised total cost as compared with the control group by approximately $700 per child. It is this difference which explains the difference in total cost with contributed resources between the center-based and center-based plus parent involvement programs. The IVH site cost increased significantly when parent time cost was included. The more intensive or earlier intervention cost which can be attributed to parent time ranged from about $1,200 to over $2,200.

Not only did parents incur significant time costs of intervention they often contributed a large part of the transportation costs at many of the sites. Parent transportation cost ranged from zero for the center-based program at Des Moines to over $1,200 at DDI in Salt Lake City. Transportation costs explained a large portion of contributed resource cost of the intervention programs. Some of the parent time costs resulted from transporting children to intervention services provided in clinic or center-based programs. For example, the Des Moines and DDI sites provided almost exactly the same services to very similar children. Because Des Moines provided transportation, it appears to be more expensive despite a higher student-teacher ratio. When parent costs are added to DDI, this picture changes.

It is clear from these figures that at many sites a large portion of the cost of these programs was borne by the parents. The cost of parent time accounts for the large difference between the cost borne by the public and total cost. It also helps explain the difference in cost between the experiment and control cost per child. Often, parents were used in the roles of intervenors at home or in classrooms, in other volunteer roles, or as providers of transportation for their children. This was naturally higher for most of the programs which increase intensity or parent involvement.

The opportunity cost to parents of the time consumed by these activities is frequently overlooked, and the omission of this cost causes some programs to appear more economical than they are in reality. Very few previous studies of the economic efficiency of early intervention accounted for these contributed resource costs (see section on Future Economic Analysis).

Home-based programs (and one-to-one short sessions in a center) can be thought of as reducing cost per child by separating child development services from child care services and focusing resources on the former. The cost of child care is then "shifted" to the parents, resulting in a program that costs the taxpayer less. Programs that provide early intervention services in center-based (and even in ordinary day care settings; see Weiss, 1981, and Rule et al., 1987) may be able to provide an additional benefit to families that offsets some of the cost.

From a legal perspective, the 1986 amendments to the Education of the Handicapped Act (P.L. 99-457) require that a "free appropriate education" be provided to handicapped 3- to 5-year-old children. In the past, this has been interpreted to mean that parents of handicapped children should not pay out-of-pocket costs or be required to provide their own transportation, but the opportunity costs of parent time have been largely ignored. We suggest that this is inconsistent. Regardless of how parents choose to spend their time (in the labor force, caring for children at home, in active or passive leisure, etc.), their time has value, and if they are required to give it up, they incur cost. As we have argued elsewhere, the economic value of a parent's time is, at the very least, what they could earn if they chose to be in the labor force (Barnett, Escobar, & Ravsten, in press).

We believe that the cost of transportation is an issue that may be receiving increased attention in the near future. Prior to the passage of P.L. 99-457, center-based programs for young handicapped children often relied on parents to provide transportation. Now, center-based programs at least must provide the transportation, but the cost may turn out to be fairly high. We have no way of estimating national costs, but we are concerned by the high transportation costs in some of the intervention programs included in the Longitudinal Studies. Similarly, in another study we conducted in Utah, we found a range of transportation costs for early intervention programs of $400 to $2,000 per child for one school year, with a significant number of programs reporting costs toward the high end (Escobar et al., 1987). Utah is a relatively low-cost state, and transportation costs may well be higher elsewhere. Given the magnitude of these costs, a search for ways to reduce transportation costs may be a high priority. For example, from our calculations, it appears that paying those parents who are willing to transport their children the value of their time to provide transportation for their children could be substantially more economically efficient than having programs provide transportation.

Program Cost and Outcomes

In our discussion up to now, we have implicitly assumed that the programs we have studied were at least approximately efficient. This means that (a) they came close to producing the best program they could with the resources available, and (b) they were not spending much more per child than could be justified by the program's outcomes. Of course, the first is not necessarily true, and the lack of information regarding the second is the reason we are conducting economic analysis.

One way of looking at the first aspect of efficiency is to see how much of the program budget is devoted to direct service. As can be seen in Tables 1 through 3, this varied from 40% to almost 90%, with the majority falling around 60%. Overall, it appears that one-to-one programs devote a larger portion of their budget to administration and other nonservice costs, although there were certainly exceptions. The results of the cost data from both SLC-IVH and LSU-IVH indicate that home visitor programs can operate efficiently.

The second aspect of efficiency is investigated by looking at program outcomes. The data presented allow comparison of the additional cost of the program variation to the effect size that results from that cost difference. It is clear that the summary effect sizes are small and do not offer evidence that the increased intervention had an immediate impact on overall measures of child or family functioning as measured by the tests presented here. This is true for the parent involvement studies, those with intensity variations, and those that offered special services to medically fragile children.

Several reasons exist for interpreting these results with caution. First, the effect sizes presented are summary measures of child and family functioning only. The effect size presented for child functioning is based only on the Battelle total score. The family functioning effect size that is presented in the table was calculated by finding the effect size on total PSI and FACES scores. The effect sizes of PSI and FACES were then summed by site and the mean of the two is presented. Only total scores for those tests were used for each site. Each of the scores presented has subcategories, the Battelle is broken down by cognitive, motor and other domains as are the PSI and FACES measures and the results of these subdomains are not included in the effect size measures presented. Each site also used complementary measures to capture variations in design unique to that site. The detailed results are presented by site throughout the report. The results presented in Tables 1 through 3 are the initial summary findings of the economic analysis portion of the studies. Economic analysis that includes the subdomains and complementary measures is continuing and will be reported at a later time.

Second, the number of posttests that have been completed for each site and on which these results are based varied by site. Some sites had completed three posttests. These include Utah Parent Involvement 85, Utah Parent Involvement 86, and Arkansas. The effect sizes in the tables are averages across those three posttest scores. Sites which have submitted data for two posttests include SMA/Lake McHenry, Sunshine, SLC IVH, Des Moines, and PITCH. Jordan, LSU VI, Wabash, ARC, SC IVH, LSU IVH, and ACDS data was based only on one posttest score. The Columbus site has not submitted results from posttest 1 and is omitted from this analysis. For several of the sites the intervention and testing is incomplete and a statement that the more intense or earlier intervention was not more economically efficient than the less intensive or later intervention would be premature.

Third, it is very difficult to measure qualitative differences in very young children. There may be effects that will appear as children enter school that do not show up in the test scores presented at this time. Cost-effectiveness analysis is limited by the fact that it does not place dollar values on outcomes. Later follow-up of the subjects in these studies will allow the use of benefit cost analysis.

The addition to total cost of the parent involvement programs was relatively small when contributed resource costs are omitted. The addition to program cost of the parent component ranged from $150 for PITCH to over $2,000 for Des Moines PIE I as shown in Table 1. This addition to cost did not add significantly to child outcomes as measured by the total BDI scores. The additional cost of parent involvement does not show a significant impact on family functioning as given by the total scores for PSI and FACES. The summary effect sizes presented for these programs do not justify the extra expenditure for any of the parent involvement sites.

Table 2 summarizes the costs and effects of the sites which varied the intensity of intervention children received. The difference in cost between the low and high intensity programs ranged from a low of about $2,200 for SLC/IVH to over $6,000 for the increased services provided at SMA/Lake McHenry. The degree to which intensity differed at the sites is highly variable. Some sites provided substantial services to both groups. LSU/IVH was the only site where no treatment was provided to the control group. The effect sizes presented suggest that varying program intensity had no significant impact on child or family functioning as measured by the BDI total score and the total scores for PSI and FACES. The addition to cost of the more intensive programs did not add significantly to program outcomes.

The medically at-risk site costs and effects are summarized in Table 3 and show the addition to program cost for early services for SLC/IVH and SC/IVH of $2,200 and $4,200, respectively. LSU/IVH cost approximately $5,000 per child for the treatment provided to the experimental subjects. The largest effect size is based on the total BDI score at LSU/IVH and it is not significant. Another site which provides services to medically fragile infants, Columbus, is omitted from the table at this time because neither the cost per child data nor the first posttest data are complete. Based on the current information, additional resources did not contribute to better outcomes for the sites that serve medically fragile children.

Given the limitations of the data presented in Tables 1-3 as discussed earlier in this section, and Table 4, the cost-effectiveness of an earlier or more intensive intervention program as compared to a later or less intensive program must be interpreted cautiously. The summary data presented implies that neither more intensive intervention nor parent involvement nor special services to the medically at-risk was economically efficient. This applies to the data for programs that used the PIE model of parent involvement as well as the parent involvement designs of ACDS and PITCH. It also applies to the intensity variations which include delayed versus early intervention as well as more and less intensive treatment for subjects matched by age. It also held for the early intervention services provided to medically at-risk children. The three cautions outlined earlier must be considered in evaluating these results. Future results, in the form of more complete test information and measurable benefits, will allow stronger statements about the cost effectiveness of the early intervention evaluated at these sites.

Table 4
Total Cost Per Child With and Without Contributed Resources

	Total Cost Per Child Without Contributed Resources		Total Cost Per Child With Contributed Resources	
Site	More Intense or Earlier	Less Intense or Later	More Intense or Earlier	Less Intense or Later
SLC/IVH	$ 3,155	$ 988	$ 5,607	$ 1,902
LSU/IVH	4,842	N/A	6,054	N/A
SC/IVH	7,392	3,168	9,838	4,339
Des Moines	7,360	6,311	8,135	6,311
LSU/VI	6,018	520	6,654	868
SMA/Lake McHenry	9,498	3,448	9,498	3,448
Sunshine	7,789	3,894	9,028	4,655
ARC	11,105	8,975	11,105	8,975
Jordan	4,908	3,001	4,908	3,001
ACDS	10,015	9,547	21,894	20,729
Arkansas*	4,123	4,123	6,248	6,248
PITCH	2,179	2,028	2,885	2,338
Utah Parent Involvement 86	4,664	4,453	7,176	6,133

* NOTE: The comparison in this study entails different modes of communication used with deaf children. Hence, there is no difference in the intensity or cost of the alternative interventions.

Future Economic Analysis

As depicted in Table 5, Design Characteristics of Studies With A Cost Component, past cost analyses have suffered from poor research design, a shortage of longitudinal data, limited economic analysis, or did not evaluate handicapped subjects. This table shows that none of the studies, except the longitudinal studies,

Table 5

Design Characteristic of Studies With a Cost Component

Study	Presence of Equivalent Group/ Experimental Design	Evaluated Handicapped Subjects	Accounting Costs Complete	Contributed Resource Costs Included
Rule et al.		X		
Taylor et al.		X	X	X
Liberman et al		X		
Stile & Thompson		X		
Stock et al.		X		
Weiss & Jurs		X	X	
Casto & Tolfa		X		
Walker		X		
Hutinger		X		
Macy & Carter		X		
Snider et al		X		
Ruopp			X	X
Love			X	
Seitz			X	
Barbrack & Horton				
Burkett			X	
Begley & Liston			X	
Barnett	X		X	X
Weber et al	X		X	X
Weiss	X	X		
Skeels		X		
EIRI Longitudinal Studies	X	X	X	X

combined all the characteristics necessary for a methodologically sound cost analysis of early intervention of handicapped subjects. The longitudinal studies offer the best evidence about the economic efficiency of alternative intervention strategies. When the studies that included benefit cost analyses are analyzed the results , presented in Table 6, are even more problematic. The combination of Tables 5 and 6 tell us that little evidence exists to draw conclusions about the economic efficiency of alternative early intervention strategies. This scarcity of information makes the economic results from the longitudinal studies particularly valuable. The results presented in this report and the analysis that is planned for these studies will greatly increase the evidence about the costs and effects of parent involvement, intensity variations, and special programs for medically at risk children.

Table 6

Previous Benefit Cost Analysis

Study	Discounting	Inflation	Health Care	School Performance	Social Service Use	Teenage Pregnancy	Crime	Earnings
Barnett	X	X		X	X	X	X	X
Weber et al.	X	X		X	X	X	X	X
Weiss				X				
Seitz et al.		X		X				X
Skeels					X			
Snider et al.				X				
Stile & Thompson	<---------- Unknown ---------->							

Cost data is still being collected at the longitudinal sites where intervention services continue. During the next year the collection of cost data at Columbus will proceed so that differences in costs for delayed versus early intervention can be examined for that site. Adjustments to the data collected at the other sites will continue as needed. Inflation and discounting must occur every year to keep the comparisons in present value and comparable to current outcomes. A more detailed economic analysis by program variation is planned and will include more detailed measures of program outcome. Next year's economic analysis will evaluate subdomains of the measures of child and family functioning as well as complimentary measures used by individual sites.

Table 7 depicts the economic analyses that could be conducted after the 1989-90 funding year for ten of the longitudinal studies. Planned analyses include measures of benefits to parents, children, and society through measurement of the variables listed in the table. Child care, the first variable listed, will be evaluated for all ten sites. Child care time saved as a result of intervention will be estimated and included as a benefit of intervention. The second variable, health care, will be estimated only for the medically at risk sites. Differences in health care costs will be estimated for subjects according to the treatment they received

Table 7

Proposed Benefit-Cost Analyses of Selected EIRI Studies

Site	Child Care	Health Care	Education	Social Services
SMA	X		X	X
Sunshine	X		X	X
Jordan	X		X	X
LSU/VI	X		X	X
ARC	X		X	X
SC/IVH	X	X	X	X
SLC/IVH	X	X	X	X
Columbus	X	X	X	X
LSU/IVH	X	X	X	X
Des Moines	X		X	X

to try to determine whether more intervention reduces later health care costs. Special education, the third variable to be estimated, will be analyzed for experimental and control subjects as they enter school. This has not been possible to date as the children are just approaching school age. Special education is more expensive than regular classroom schooling. Differences in use and costs of special education will be examined and benefits from different types of intervention will be assessed. Finally, subjects' and their families' use of social services will be evaluated to see whether more or earlier intervention affects use of programs such as SSI or residential care facilities.

The variables that would be evaluated as part of future benefit cost analysis may show differences that resulted from treatment that are not apparent in the test scores used to date. It is particularly important to estimate the described benefits as the benefit cost analysis done on early intervention programs in the past offer little useful information about the economic efficiency of early intervention. The longitudinal studies present us with the chance to find out whether later outcomes, as measured by differences in health care costs, educational success, and use of social services, exist in the presence of small effect sizes. The longitudinal studies provide a significant addition to the existing information about the costs and effects of a variety of early intervention strategies. Benefit cost data that would result from later follow-up of the subjects in the ten selected sites will provide evidence that does not currently exist in the literature about the economic efficiency of the types of early intervention compared in those studies. This would include evidence about all three program variations, parent involvement, intensity and the medically at risk population. It is possible that the economic analysis will capture differences in ability or success that tests of young children and their families fail to capture.

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